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WHEAT-VARIETY TRIALS IN THE SOUTH ISLAND: SEASON 1934–35.

Fields Division, Department of Agriculture.

IN the 1934–35 season wheat-variety trials were laid down by the Fields Division in collaboration with the Wheat Research Institute on twenty-nine farms in the South Island. Unfortunately, seasonal conditions prevented weights being obtained from seven of the experiments, lodging being the cause in most cases.

VARIETIES UNDER TRIAL.

In all the experiments Solid Straw Tuscan was taken as the standard variety with which the others were compared.

Cross 7.—The results of extended trials with Cross 7 in the 1933–34 season (1 and 2) showed the general superiority in milling and baking qualities of this variety over Solid Straw Tuscan, although the latter was slighly better in yield on the average. In order to get more information, particularly in regard to certain localities, further trials with Cross 7 were sown in the 1934–35 season, and fifteen of these were harvested.

Marquis.—In view of the popularity of this variety in Marlborough, and the need of getting some information on its performance, Marquis was included in three trials in that district.

Jumbuck.—In previous years attempts had been made in Canterbury to carry out trials with Jumbuck, a variety which has met with success as a spring-sown wheat in the North Island. Through various causes experiments were not harvested until 1933–34, when two trials were successfully completed. In one of these (in Canterbury) Jumbuck was equal to Tuscan in yield, and in the other (in Otago) it was outyielded by Tuscan. Two experiments comparing these varieties were sown in the spring of 1934 in Canterbury.

Portuguese Varieties: S/617 and S/668.—In preliminary spring-sown trials conducted in Otago and Southland, two Portuguese varieties, which had been picked out by the Wheat Research Institute as promising lines from a number of imported varieties, yielded well. They were therefore included in one trial at Morven in the 1934–35 season and were also sown in a trial carried out by the Wheat Research Institute at Lincoln College.

Other Varieties.—Selections of Solid Straw Tuscan supplied by the Agronomist and crosses originating from the Wheat Research Institute were under trial, but, as this was in the nature of preliminary work, the results are not recorded in this report.

Method of conducting Experiments.

The Beaven half-drill strip method was used in nearly all the trials, and ten replications of each variety were sown. A standard rate of seeding of 2 bushels per acre for each variety was generally adopted, and in all cases 1 cwt. of superphosphate was sown with the seed. Harvesting was usually carried out when the later-ripening varieties in the trial were in fit condition. At harvest samples of each variety were collected and sent to the Wheat Research Institute for milling and baking tests.

Results of Trials including Cross 7.

Particulars of dates of sowing and harvesting and results of each individual trial harvested in 1935 are given in Table 1. Observations during the growing period indicated that Cross 7 generally ripened a few days earlier than Tuscan. In spite of heavy nor-west winds in one or two cases, Cross 7 showed no tendency to shake in spite of being dead-ripe. In several trials Tuscan lodged fairly badly, whereas no lodging occurred in the Cross 7 plots. As some of the experiments where lodging took place could not be harvested, the figures in Table 1 do not include at least three trials in which Cross 7 would have undoubtedly outyielded Tuscan had it been possible to harvest and weigh the plots.

Table 1.—Yield in Bushels per Acre and Differences from Solid Straw Tuscan in Trials with Cross 7.

Location of Trial.	Date sown.	Date harvested.	Yield in Bushels Per Acre.		Difference in Favour of Tuscan (+) or Cross 7 (−).
			Cross 7.	Tuscan.	
Marlborough.					
M. Walsh, Omaka ..	17/5/34	28/12/34	34·5	29·7	− 4·8†
Smith Bros., Tua Marina	26/5/34	3/1/35	33·4	28·6	− 4·8†
F. F. Mills, Grovetown ..	12/6/34	5/1/35	28·1	16·7	−11·4†
Canterbury.					
G. H. Cross, Oxford ..	31/5/34	12/1/35	13·7	14·9	**+1·2**
H. Tallot, Cust ..	6/7/34	21/1/35	12·5	12·4	−0·1
Canterbury Seed Co., Leeston	5/9/34	1/2/35	34·7	33·1	−1·6
G. C. Warren, Darfield ..	1/8/34	14/1/35	16·2	17·2	+1·0
R. Ruddenclau, Lyndhurst	29/6/34	22/1/35	21·9	27·3	+5·4†
D. Spence, Sherwood ..	27/6/34	15/1/35	14·0	13·7	−0·3
C. Campion, Highbank ..	19/6/34	22/1/35	25·9	26·0	+0·1
J. Ruddenclau, Methven..	13/7/34	23/1/35	18·6	21·1	**+2·5**
Campbell Bros., Kingsdown	11/8/34	1/2/35	24·0	26·7	**+2·7**
Lincoln College* ..	..	..	51·4	50·7	−0·7
North Otago.					
B. G. Porter, Tokaraki ..	30/5/34	9/2/35	33·0	34·9	+1·9
W. Stevenson, Incholme ..	25/5/34	17/1/35	31·0	34·2	**+3·2**
D. M. Borrie, Papakaio ..	31/5/34	21/1/35	42·3	44·0	+1·7

* Trial carried out by Wheat Research Institute at Lincoln College included for purposes of record.

† Plots not threshed separately so that statistical examination was not possible. The magnitude of these differences, together with observations prior to cutting, indicated, however, that they were all real.

Note.—Differences in heavy type are statistically significant.

COMMENTS ON TABLE 1.

Out of the sixteen experiments five gave significant or real differences in favour of Solid Straw Tuscan and three in favour of Cross 7. As the latter all occurred in Marlborough, it would seem that Cross 7 has a definite place in the latter district, particularly since in the previous season a large difference in favour of Cross 7 was recorded in one experiment. Although the performance of Cross 7 in Canterbury and North Otago is not as good as in the 1933–34 season, in at least three trials from which yields could not be secured Cross 7 would almost certainly have given higher yields than Tuscan, and there is no doubt that under conditions conclusive to lodging Cross 7 will show to advantage. As in previous seasons the milling and baking qualities of Cross 7 were generally higher than those of Tuscan.

Results of Other-variety Trials.

The yields of Marquis, Jumbuck, and the Portuguese varieties are shown in Table 2.

Table 2.—Yield in Bushels per Acre and Differences of Miseellaneous Varieties from Solid Straw Tuscan.

Location of Trial.	Variety.	Date sown.	Date harvested.	Bushels per Acre.	
				Yield of Variety.	Difference in Favour of Tuscan(+) or Variety(−).
M. Walsh, Omaka ..	Marquis ..	17/5/34	28/12/34	25·4	+3·8*
Smith Bros., Tua Marina	Marquis ..	26/5/34	3/1/35	38·9	−5·0*
F. Mills, Grovetown ..	Marquis ..	12/6/34	5/1/35	23·1	−6·6*
Canterbury Seed Co., Leeston	Jumbuck ..	5/9/34	1/2/35	33·4	**−5·8**
J. C. Hay, Morven ..	Jumbuck ..	18/9/34	26/1/35	15·3	**+9·3**
J. C. Hay, Morven ..	Portuguese 617	18/9/34	26/1/35	26·2	**−2·1**
J. C. Hay, Morven ..	Portuguese 668	18/9/34	26/1/35	28·0	**−4·5**
Lincoln College ..	Portuguese 617	Autumn	..	57·5	**−5·9**
Lincoln College ..	Portuguese 668	Autumn	..	61·4	**−10·4**

* Yields not examined statistically.

COMMENTS ON TABLE 2.

The good results from Marquis in two of the experiments in Marlborough, especially in view of its reputation as a high-quality wheat, support the preference shown towards it by many growers in the province.

Jumbuck was significantly higher in yield than Tuscan at Leeston, but was significantly lower at Morven. In the present season two trials, in which Jumbuck is included, are being conducted in the latter district.

The Portuguese varieties proved successful at Lincoln (autumn-sown) and at Morven (spring-sown). In both trials the baking scores were much higher than those of Tuscan. As there is need of a variety suitable for spring-sowing in Canterbury and Otago,

the performance of these Portuguese lines is very gratifying, and they have been included in several spring-sown trials during the present season.

ACKNOWLEDGMENTS.

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—*J. W. Woodcock, Crop Experimentalist.*

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FARMING IN THE AUCKLAND PROVINCE.

OBSERVATIONS ON FARM-MANAGEMENT METHODS.

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IV. THE BAY OF PLENTY.

THE farming-areas of the Bay of Plenty consist on the west of a narrow coastal plain and hills rising to the edge of the Central Plateau; towards the east the plain ends and is succeeded by broken greywacke hill country, being the spurs of the Raukumara Range. The coastal plain consists of rolling hills and plains of sands and silts merging into peat and alluvial swamps which lie behind the coastal sand-drifts; the Rangitaiki Plains lie between the Tarawera and Rangitaiki Rivers in the middle portion of the Bay.

The climate of the Bay of Plenty is warm and humid; the mean annual rainfall is 50 in.; the winter is mild, the summer warm, and conditions are very suitable for maize-growing, and, as Arthur Young observed, "the proof of a *good climate* is that Indian corn (maize) comes to perfection in it."

*Table VI.—Crops and Live-stock: Table showing Areas in Crops and Pasture and Numbers of Live-stock in Bay of Plenty Counties, 1933–34.**

County.	Crops.			Live-stock.			
	Annual Crops.	Pasture.	Pasture cut for Hay and Silage.	Dairy Cows.	Other Cattle.	Sheep Shorn.	Pigs.
	Acres.	Acres.	Acres.				
Tauranga ..	4,663	128,916	14,939	51,073	31,590	17,339	20,715
Whakatane ..	4,523	129,567	11,354	44,446	27,325	52,251	20,298
Opotiki† ..	1,178	125,475	4,703	19,162	17,399	92,782	8,257
	10,364	383,958	30,996	114,681	76,314	162,372	49,270

* From Agricultural and Pastoral statistics. † Opotiki County is in the Gisborne Land District.

Farming consists of dairy-farming, fat-lamb raising, and cattle-fattening on the coastal plains, and the grazing of Romney sheep and beef cattle on the surface-sown hill country at the eastern end of the Bay. Citrus-growing is becoming an important industry in Tauranga County, where there were 351 acres in bearing and 172 acres in non-bearing orchards in the 1933–34 season. Maize-growing is an important industry, although the acreage under this crop is not as great as it was once: fifteen years ago fully 8,000 acres were grown, but now the acreage is only 3,000. For the past three seasons maize-production for grain has been as follows:—

Season.	Counties.		
	Tauranga.	Whakatane.	Opotiki.
	Acres.	Acres.	Acres.
1931–32	1,330	1,316	539
1932–33	1,636	1,590	681
1933–34	1,579	1,704	597

The production of maize has encouraged the development of profitable side-lines—poultry-farming, and pork and bacon production—to dairying. Maize is not a complete food for stock-feeding: it is low in protein and its proteins are unbalanced, but it can be produced cheaply, and its extended production would facilitate the expansion of the pork and bacon industry. In bacon-production in the Bay, maize is largely fed to autumn litters through the winter, the pigs are carried forward into the spring in a thriving condition, and are finished off in the spring on skim-milk.

Maize is a wonderful cereal; it has been described by Cobbett as "the choicest gift of God to man in the way of food." and more use could be made of the crop in all the warmer parts of the Auckland Province. In the Bay of Plenty maize is grown on both the rich flat alluvial soils and lighter hill and terrace country; on the flats a crop of swedes is usually taken after grass, and then follow one, two, or three crops of maize for grain, after which the land is resown to grass; on the light hill and terrace land maize always follows grass, and usually only one or two crops are taken before the land is resown to pasture. On areas where frosts are experienced in the late spring and autumn, rapidly maturing varieties are grown—Early Butler, Early Morn, and Funk's Yellow Dent. On rich land, with late varieties, yields of 80 bushels are obtained, whilst the early varieties seldom produce more than 50 bushels. Maize is sown from about the 20th of October to the 10th of November, with a maize-planter, in rows 3 ft. apart with the plants spaced about 1 ft. apart in the rows; 14 lb. of seed are sown per acre, with usually 2 cwt. of phosphatic fertilizers. The crop is intercultivated four or five times, commencing when the plants are 4 in. to 5 in. high, and repeated fortnightly until the crop is too high for intercultivation. The early varieties mature in four and a half to five and a half months whilst the late varieties take six and a half to seven months. After harvesting, the maize is stored in a crib for a month to six weeks before shelling(19). The grain is largely used for feeding poultry and pigs along with skim-milk, and, with the help of maize, many Bay of Plenty dairy-farmers are securing a net return of 3d. per pound butterfat from pork and bacon.

TAURANGA COUNTY.

August 6th, 1934: Athenree to Te Puke.—The high fern-clad hills that surround the Waihi Plains give place at Athenree to low rounded downs, and flat-topped spurs sprawl out into the shallow Tauranga Harbour. Athenree was one of the homesteads of the Katikati Settlement of 1878, made under the Auckland Waste Lands Act, 1874, which

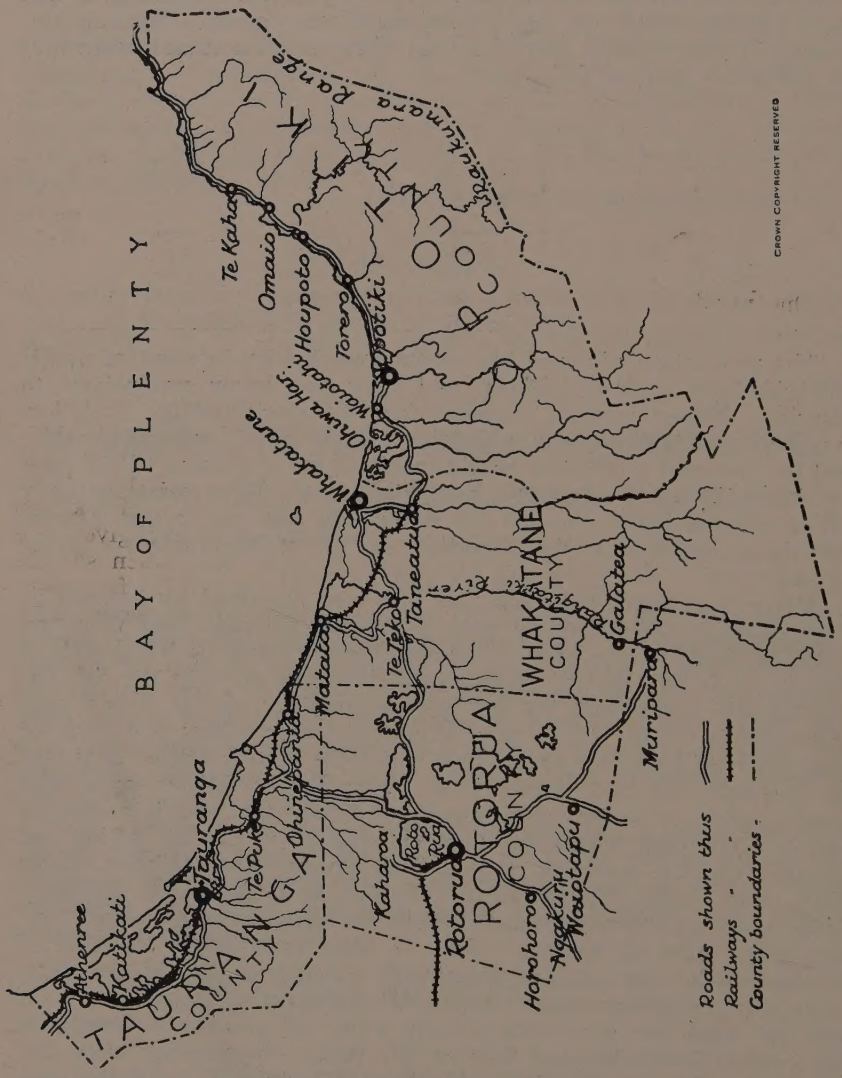

FIG. 7. SHOWING JOURNEYS IN TAURANGA, ROTORUA, WHAKATANE, AND OPOTIKI COUNTIES.

" provided for setting aside blocks of land as special settlements, and appointed immigration agents therefor, and authorized the Superintendent to contract with any person for the formation of special settlements, no settlement to contain less than ten families, whilst the area to be settled was not to be less than 1,000 acres." Under this authority settlements were formed at Te Puke, Katikati, Albertland,

Whangarei, and Kaipara, and brought many new settlers to the Province. The Auckland Land Board, on the 31st July, 1877, agreed to the setting-apart under section 56 of the Auckland Waste Lands Act of 1,874 of 10,000 acres in the Katikati district as a special settlement, and the Government was recommended to enter into a contract with George Vesey Stewart for the purpose. Mr. Stewart was to have the land surveyed at his own cost, price to be £1 per acre, of which 10s. per acre was to be paid in cash to the Agent-General in London, and the second 10s. per acre to be made by the introduction by Mr. Stewart rom the United Kingdom of one adult emigrant for every 75 acres of land—that is, 133 emigrants in all—the emigrants to be approved by the Agent-General and to be placed on the land on or before the 1st November, 1878. It was further contracted that " within eight months after the arrival of the emigrants he shall erect at least thirty-five weatherboard houses, one house for each block occupied, and to contain three rooms ; that the emigrants shall be placed on the land and reside continuously thereon ; that one-fifth of the total area shall be cultivated."(20)

One wonders just what was meant by " cultivated "—the profitable farming of this land was not possible until the development of transport, top-dressing, and dairy-farming. " We took a walk," writes Mrs. Hugh Stewart, of Athenree, " over wild, uncultivated, undulating land, feeling homesick and depressed . . . tea-tree (manuka) covered most of our land, was good for nothing but firewood, and after clearing, burning, ploughing, and cropping, came up again and again from seed. . . . Our cow, a recent purchase, was found next day staggering about, wheeling round and round in a most alarming fashion. Luckily a half-caste passing saw her and said, ' Your cow is tutu'd ; give me a sharp knife,' and promptly bled her, cutting her ears, when she fell down exhausted, but did not die, as many of our cows did from time to time later on, when having eaten too greedily of a poisonous native plant ' tutu.' . . . The weather being very hot, Hugh got up at 5 a.m. to churn, I following suit when he called out ' Butter has come,' to pass it through the butter worker and make it up into pounds, wrapped in parchment paper stamped ' Athenree Separator.' . . . This year we had so good a crop of wheat that we sent six sacks of it to the Katikati miller, who in due time returned as many more of flour, pollard, and bran. . . . With an annual return of 8,000 to 10,000 eggs, I was able to sell some at prices varying from 6d. to 1s. 2d. per dozen. . . . I reared 150 to 200 chickens and ducks annually, with a ready sale at 1s. 6d. to 2s. each. . . . Sometimes we could get an order for 100 dozen lemons at 6d. . . . Onions at 1d. per pound, cucumbers 6d. per dozen, and tomatoes 1d. per pound were always saleable. . . . Hugh now invested in fifty-six ewes and lambs, which were the beginning of a little money-saving in mutton and money-making in wool. . . ."(21)

Until the advent of the dairy factory, farming was mainly subsistence farming, with farm butter, eggs, and vegetables as the marketable products. The grassing of the light soils on the fern-clad hills was done with low-fertility-demanding grasses, ratstail and *Poa pratensis*, for rye-grass, cocksfoot, and white-clover pastures could not be established without top-dressing. Old pastures have been gradually ploughed up and resown, and these low hills are now in quite fair pastures,

but ratstail persists in many fields, and at this time of year the dead growth on the ratstail plants gives the pastures a whitish appearance. Pasture-growth is at present short and dairy cows are being fed on hay, whilst on some farms the dry cows are grazing down maize-stalks.

Much of the inland hill country is not suitable for sheep without special treatment, the land being unhealthy, but recent work with limonite and salt-licks has shown that, provided management is otherwise good, sheep can be raised on sick country. Ragwort is becoming troublesome on much of this hill country, and sheep-grazing is the only economical way to control it. Continuing on towards Tauranga, citrus orchards become fairly numerous—here and there are lemon orchards in various stages of development, from young trees to trees in full bearing. The low, undulating coastal country continues right on to Matata, with at Te Puke some fairly extensive areas of drained coastal swamps, behind which rises a wide terrace, broken into easy undulations. It is a country of dairy-farms, and sheep are only seen on the coastal drained swamps. Pastures on the swamps are far more advanced in growth than the pastures on the undulating hills, chiefly on account of the greater proportion of perennial rye-grass in them. During the long period when false perennial rye-grass was the main rye-grass seed in the market, it was considered that this light undulating country "would not carry rye-grass." Rye-grass mixtures were certainly used, but the pastures were long-rotation rather than permanent, and a considerable amount of maize-growing and fodder-cropping was done. The introduction of certified perennial rye-grass has changed the whole aspect of farming this class of land, and the earliness of a dominant rye pasture on this light, undulating land was well exemplified in a demonstration plot examined at Te Puke. A square of rye and white sown in the middle of a pasture made a striking picture. The main pasture of the field consisted of cocksfoot, rye-grass, and white clover, with some ratstail here and there. The field had been hayed the previous summer, the cocksfoot-plants had become tufted, and recent frosts had whitened the cocksfoot-plants and growth was at a standstill; but the plot of perennial rye-grass and white clover was green and growing. Rye-grass, paspalum, and white clover make the ideal sward for Bay of Plenty conditions.

WHAKATANE COUNTY.

December 5th, 1934; Matata, Te Teko, Taneatua.—A fine, hot day, with hay and ensilage harvesting everywhere in full swing; lucerne crops have recovered from the first cut in November and are already 1 ft. high. Each year about 200,000 acres of pasture-land in the Auckland Province are harvested for hay and 60,000 acres for ensilage. Hay and ensilage crops then are of considerable importance and value. A great deal of hay harvested in the Auckland Province is cut late, is very fibrous, and is badly cured—either sun-bleached or harvested damp, turning out of the stack musty or mouldy. Ordinary dairying permanent pastures consist of rye-grass, cocksfoot, and white clover, with varying amounts of poorer grasses and clovers such as Yorkshire fog, sweet vernal, goose-grass, suckling clover. Hay of the highest feeding-value is obtained when the rye-grass is just coming into flower and the green material consists of rye-grass, white clover, and the leafy growth of cocksfoot. The greatest yield is usually obtained at a later

stage when the cocksfoot is flowering, but the rye-grass will then have become fibrous and the white clover dried. Early cutting gives a light yield of good-quality hay and a good aftermath, later cutting gives a higher yield of more fibrous hay and a very poor aftermath; in fact, in a dry year a field cut for hay in January may not provide any real feed until March, and it may take a year or two of careful stocking and top-dressing to bring back a good sward. But early cutting for hay has the disadvantage that the weather in November and early December is often unsettled and haymaking is difficult. This is where ensilage-making comes in, for it is independent of the weather—the grass can be cut and ensiled at any time. Fields for both ensilage and hay should be closed early, and thus close subdivision is an advantage, for with close subdivision it is often possible to take a field from the grazing rotation by the middle of September, followed by other fields right through October, and allow of a really early start on ensilage-making, so that all cutting, both for hay and silage, can be finished in December. The rule of haymaking is to dry the hay as quickly as possible (by turning and shaking out) and as soon as it is dry protect it from bleaching in the sun and from wetting by the dew and rain. The introduction of mowers, swathe-turners, side-delivery rakes, sweeps, and stackers has hastened the work of haymaking and allows of the quick handling of hay during periods of good weather. But the introduction of machinery has not entirely solved the problem of haymaking—the weather cannot be controlled or forecasted, and no machine has yet been invented that will build cocks; machinery costs money both to purchase and maintain, and an elaborate range of haymaking machinery is beyond the means of the average small farmer. Even with machinery, haymaking still necessitates the employment of casual labour, and reliable casual labour is difficult to obtain, for dairying does not provide fairly regular casual work for farm labourers as arable farming does (where seasonal work includes haymaking, cereal-harvesting, hedge-cutting, potato-digging, and root-thinning). The necessity for extra labour at hay and ensilage making has brought in the system of co-operative work amongst groups of farmers, but, as crops have then to be harvested in rotation, it usually results that haymaking is either rushed or the last crops are cut very late. The cause of most bad haymaking is lack of labour and machinery, and not lack of knowledge as to how good hay ought to be made.

Beyond Matata the country opens out into a large plain—the Rangitaiki Plains—stretching to Whakatane in the east and Te Teko in the south. It is a great fertile plain of drained alluvial soils and peat swamps. Development has proceeded rapidly, and the plains contain some of the finest dairying land in the province: the alluvial soils are light, formed of pumice from the Central Plateau, and are not troublesome to farm like the heavy alluvial soils of the Hauraki Plains. The land is generally held in comparatively small holdings, and the pastures are of excellent quality, with rye-grass, paspalum, and white clover as the dominant pasture-plants. Dairying is the main industry with the important side-lines of maize-growing and pork and bacon production. At Te Teko, at the southern end of the plains, the land is covered with a layer of Tarawera ash, a coarse gritty sand that holds moisture poorly; this also covers much of the undulating to hilly land (in bracken fern and tutu) south of the plains in the valleys of the

Rangitaiki and Tarawera Rivers. Examined some pastures at Te Teko that were sown a few years ago on the light soils covered in Tarawera ash; for the first two or three years red clover was the dominant plant in the pastures, but it has now gone out and the pastures show a good deal of bare ground, with the white clover going off, due to the dry weather. On these light soils red clover is dominant in the pastures for the first three years, but these early years of high production are no measure of the ultimate carrying-capacity. Where the surface pumice soil is of good moisture-holding capacity, high-class permanent rye-grass and white-clover pastures can be maintained, but where the surface soil is coarse and holds moisture poorly white clover is not permanent and subterranean clover has yet to be tried to prove whether they can be satisfactorily grassed. Lucerne does well on these coarse sandy soils, and there are some excellent stands at Te Teko—established at the first ploughing of manuka land.

August 28th, 1935: Matata, Thornton, Whakatane.—I was very interested in the methods adopted by local farmers in the feeding and management of pigs. During the past two or three months I have visited a very large number of dairy-farms, and have been impressed with the need for a really practical method of housing and managing pigs on dairy-farms. I have seen hundreds of acres of small $\frac{1}{8}$ acre fields, only established a year or two ago, a hopeless sea of mud—fields that were established to give pigs *good clean pasture;* I have seen farms on which these small paddocks had become wet and muddy, and where farmers had again turned to sties, and where farrowing in sties had been unsatisfactory and the sows and suckers had again been turned out into the muddy yards on account of the young pigs scouring at three weeks of age; farms where both sties and small paddocks had been temporarily abandoned and all pigs given a free range of the whole farm. We have yet to evolve a satisfactory housing and grazing system to suit local conditions, and the keynote of the system must be the health of the pigs, and it must be a system that does not entail too much labour. Health is essential, and rapid gains in live-weight cannot be secured under unhealthy surroundings.

As a starting-point we may take it that pigs running on good, clean well-drained pastures are healthy, but once the grass turf on the fields deteriorates, and mud and water take the place of grass, pigs become unhealthy, chiefly through parasitic infection. Pigs can also be kept healthy in sties, but this entails a good deal of work. Sty-management is common in European countries, but even there this method is usually only satisfactory where the number of pigs kept is adequate (twenty-five to twenty-eight sows) to provide full-time employment for at least one man. In sties, if no run-out to grass is available, difficulties are experienced in the rearing of young piglets from about three weeks of age on account of scour. Where the young pigs are given a run-out daily on grass, even if for only a short period, scour does not appear; if a run-out is not available, the provision of a fresh turf or sod daily appears to overcome the difficulty. It is the work of keeping the sties and surroundings clean that makes them somewhat unsatisfactory for local dairying conditions, where the ordinary farm labour is fully employed in milking and farm work, and only five or six sows are kept. Drainage is often a difficulty, for a sty of ten baconers in the last stages of fattening will be getting about 6 gallons of skim-milk each per day—a total of 60 gallons of liquid food.

A few years ago there was a fairly general opinion that grass could be made quite an important item in the ration of fattening pigs, but recent work has shown that although grass is of value for mature pigs—*e.g.*, dry sows—it has little real feeding-value for young fattening pigs. The establishment of small ⅛ acre grazing fields aimed at giving pigs good fresh young grass, and it has broken down because the pig is a bad grazing animal, the turf on these small paddocks rapidly deteriorates, and also because pigs do not like short grass; they like fairly long grass—give pigs a free range of the farm and they will make for the fields that have been spelled and are ready for grazing by the dairy herd. The value of special pig pastures, such as lucerne, red clover, and white clover, where the pigs will get their food easily, is a matter now under investigation. But under our system of dairying, with pigs only a side-line, grazing-areas for pigs must figure largely in the final system adopted, for farmers have not the time or money for the elaborate system of indoor housing with occasional runs outside, and by running pigs out on good clean pastures their health is assured.

Pig-management on many dairy-farms on the Rangitaiki Plains has reached a high standard of efficiency, and the farmers are evolving a system worthy of imitation over large parts of the Auckland Province. Dry sows are run out on the large pastures of the farm, and this is general practice; at farrowing they are brought into small ⅛ acre paddocks; after weaning the weaners and sows are again run out in the larger paddocks of the farm, and then, when about 140 lb. to 150 lb., they are brought in and finished off for the last month or six weeks in sties. In the management of the small ⅛ acre fields it is recognized that if a good turf is to be kept on these fields other grazing stock must be used besides pigs, and during the maximum growing period of the grass—the late spring and summer—pigs are kept out of these fields and they are grazed with dry cows or yearlings, and, if necessary, the fields are mown. The question arises whether these ⅛ acre fields are really necessary, seeing that after a trial many farmers are now farrowing the sows on the general farm pastures, and a great deal of care is necessary to keep a good turf of grass on these small paddocks. It depends on circumstances, but there is a great advantage in keeping each sow and litter separate and handy for feeding and looking after. The whole success of pork and bacon production depends on raising weaners as near to 40 lb. at eight weeks as possible. During the rearing-period it is essential that the young pigs should grow steadily, and it is necessary to feed them from a separate trough from three weeks of age. Of course all this can be done in the larger fields, but only with increased time and work. However, large paddocks with good clean pastures and normally grazed by other stock are preferable to small paddocks with a bad turf and wet muddy patches. After weaning, the young pigs are run out on the ordinary grazing-pastures; they make quite as good gains as they do if shut in ⅛ acre fields and they should not be run so thickly as to spoil the grass for other stock. At about 140 lb. to 150 lb. live-weight the pigs are brought in and sty-fed for the last month or six weeks. Care is taken in the construction of the sties that they are draught-proof and sunny: for a pen of eight to ten baconers the shelters are 9 ft. deep by 9 ft. wide and 4 ft. 6 in. to 6 ft. high, with a concrete yard of about the same size in front. The floors of the shelters are of wood, with a slight slope (about 4 in.) to the front. During the

period the pigs are being finished off in the sties they are given at least half a day a week run out in a good clean paddock to keep them in health.

I was also very interested in the methods adopted by local farmers in the feeding of maize to pigs. On the rich alluvial land maize crops will produce 80 bushels to the acre, and the rotation commonly adopted is to plough old grass, follow with swedes for winter feeding, and then maize for one, two, or possibly three years and then sow down to grass again. With this rotation the swedes and young grass provide adequate winter and early-spring feed for cows, and the maize pays for the cost of cropping and resowing to grass. It also allows of a good profit on pig-feeding, for local farmers estimate that, with maize for winter feeding, the profit from pork and bacon is in the vicinity of 3d. per pound of butterfat produced. The bulk of the maize is fed to autumn litters which are carried through the winter in a thriving condition and finished off for bacon in the spring and summer mainly on skim-milk. The maize is normally fed on the cob, and the cobs are soaked before feeding for about three days in the winter and thirty-six hours in the summer.

This Bay of Plenty rotation of swedes and maize is of particular interest, for the wider use of annual forage crops is often advocated as a means of increasing production on dairy-farms. Against the growing of annual crops for supplementary feeding is the fact that the tremendous increase in butterfat-production during recent years has been brought about by better grass-farming and not by the growing of annual supplementary feeding crops. The all-grass dairy-farm has greatly increased in favour: its success depends on good pastures, close subdivision, top-dressing, and a reserve of grass ensilage stored up for periods of scarcity. All supplementary feed is provided by hay and silage secured from permanent pastures. Pastures do not throw their feed evenly throughout the year; a good pasture produces about 75 per cent. of its annual production in the period October to January inclusive and 25 per cent. during the remainder of the year. An efficiently fed herd of good production requires 40 per cent. of the year's total supply of feed in the October to January period and 60 per cent. during the remainder of the year. The all-grass dairy-farm spreads the feed to the requirements of the herd by harvesting roughly 40 per cent. of the grassland for hay and silage. The system has been very successful; under it most Auckland dairying land is capable of producing 175 lb. to 200 lb. of butterfat per acre; some farms do more, even 300 lb. It is economical; there is no cash outlay for cultivation, seed, and fertilizer for annual crops and for resowing the land to grass. Its weaknesses lie in the labour necessary for hay and silage making and the tendency to lowered production in adverse seasons. Grass is often short in the early spring, and a really dry summer may seriously deplete the reserves of ensilage and lead to inadequate feeding the following winter. Also ensilage is not a complete substitute for young grass for milk-production. There are difficulties certainly in all-grass dairy-farming, but they can be overcome to some extent. The use of lucerne and paspalum increases the feed-supply over the summer months. Lucerne is warranted on all farms where the soil is suitable for its cultivation; the first cut can be used for

ensilage along with early-mown pastures, subsequent cuts can be used for soiling if pastures are short or turned into hay or silage if pasture-growth is good. Grass-growth in the early spring can often be increased by special top-dressing: shelter is also an important factor in helping grass-growth during the summer and early spring: it is strong winds that dry up pastures so much and cut back the growth.

Most annual forage cropping on dairy-farms is done as a stage in pasture renewal, for farms with poor pastures usually have a poor winter and early-spring grass-production—in short, the pastures lack rye-grass. Crops grown include swedes and mangels for winter feeding, green cereals for the early spring, soft turnips, millet, or maize for summer feeding. A common arrangement is to break up old grass in February or March, sow oats in April, feed off in the early spring (often the oats are omitted and swedes follow grass), replough, sow in swedes, and follow the swedes with soft turnips, millet, or maize for summer feeding and resow to grass in the autumn. The whole aim of the system is better pastures and better feeding—to get the land into good rye-grass and white-clover pastures and to carry more and better-fed stock. Many farms have greatly increased butterfat-production by using forage crops to improve the pastures, but once the farm is all in good grass, annual forage crops are dropped and reliance placed on grass. In short, it does not pay to break up good grassland to grow annual forage crops; but there is, I think, one exception, and the exception is where a cereal or a cash crop is grown in the rotation. This is what makes this maize and swede rotation in the Bay of Plenty so interesting. It is not necessary that this swede-maize rotation should be worked with permanent grass. It could be worked quite well with temporary pastures, for Italian rye and red-clover pastures would in many respects be more suitable. The pasture would be cheaper to sow, it would give more winter and early-spring feed, and in its second year the red clover would produce good summer feed. The use of temporary pastures might bring the swede crops somewhat close together in the rotation, but this could be overcome by substituting chou moellier for swedes in the later years of cropping. An analogous case to this maize and swede rotation is the potato cash crop taken on South Auckland dairy-farms. The two usual crops rotated with the potatoes are mangels and green oats, whilst the grass may be either temporary or permanent.

The rotation of forage crops with temporary grass, without a cereal or a cash crop, is often advocated but seldom practised. The idea is based on the fact that permanent pastures are most productive when rotationally grazed, and are not closed for hay and ensilage making. The idea is to rotate forage crops with temporary grass, save all hay and silage from temporary pastures, and keep the permanent grassland rotationally grazed throughout the year. The weakness of the system is the cost and labour required: if it is to be profitable it must increase the butterfat-production to the point where it pays for the cost of cultivation, seed, fertilizer, and labour. This it apparently does not do.

OPOTIKI COUNTY.

August 29th, 1935; Opotiki to Te Kaha.—A fine but windy day; the road follows the coast, passing the ends of the steep spurs leading

up to the Raukumara Range and crossing narrow shingle plains in the stream and river valleys. There are some fine flats at Opotiki used for dairying and maize-growing, but beyond Opotiki there is only a very limited area of ploughable land, and the country consists of ridge after ridge of steep greywacke hills in danthonia, scrub, and forest. Most of the easy coastal country is used for dairying by the Maori owners, and the pastures generally are poor, the swards consisting of ratstail, hair-grass, Indian doob, and trefoil, with rye-grass and white clover only where the land has been top-dressed. During recent years the Maori farmers have done a good deal of clearing up on the manuka-clad foothills, and have grassed after manuka burns; quite good pastures of rye, cocksfoot, and white clover have been established, and, provided these are top-dressed, a good sward of grass should be maintained. The greywacke hills are mainly in danthonia and brown-top—fairly clean on the sunny faces but showing a great deal of reversion to fern and manuka on the more shady slopes. At Te Kaha there is a Native settlement of Maori dairy-farmers. Here bullocks are used for farm work instead of horses—there are bullock carts, and bullock teams do the pasture-harrowing and other cultivation work. Some maize cropping is done, but after maize the land is usually allowed to tumble back to grass by itself, hence many of the pastures consist of ratstail, doob, hair-grass, and suckling clover. The surface-sown hill country is used for the extensive grazing of Romney sheep, and for the 1933–34 season there were 92,782 sheep shorn in the county.

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INTERNATIONAL STANDARDIZING OF HERD-BOOKS AND MILK-RECORDING.

Efforts have been made recently to reach more uniformity in methods of herd-book keeping and milk-recording in the different countries. As a matter of fact, these methods, as is clearly shown in a monograph published by the International Institute of Agriculture at Rome, differ greatly from one country to another and do not permit any comparison of data furnished by herd-book organizations and milk-recording societies. This is a considerable handicap to the international trade in pedigree animals and in international studies of genetics and dairy records, which are based on those data. Proposals to unify methods of milk-recording were made at the World Dairy Congress in Copenhagen, 1931, which distinguish three classes of milk-recording methods according to the degree of accuracy. The question of making herd-book methods more uniform has been discussed at the Agricultural Congresses in Prague and Budapest, and recently in a conference of experts held at the International Institute of Agriculture in February, 1935. The Conference has established some general principles of herd-book keeping as a basis for future uniformity. At present these proposals are being studied by the Governments of the different countries, and they will then be presented to a diplomatic conference for definitive adoption.

ST. JOHN'S WORT AND ALLIED SPECIES.

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THE genus *Hypericum* includes about 300 species, mainly of the temperate regions of the world. A number are ornamental shrubby or herbaceous plants, now grown the world over for their bright flowers or pleasing habit, some of the low-growing forms being prized for rockeries. The genus also includes several species that have become more or less objectionable weeds, notably St. John's wort. The majority are perennials with distinctly angled stems. The leaves are arranged in opposite pairs, and when held to the light are seen to be dotted with pellucid or sometimes black glands. Hypericum oil, of some slight medicinal value, is obtained from certain species, while many contain an acrid and slightly bitter juice yielding a yellowish dye. The flowers are occasionally solitary, but more often occur in groups at the summits of the branches, with a three-forked arrangement of their stalks. In most species the flowers are of various shades of yellow, but pinkish, rose, and purplish forms are known. The sepals and petals are in fives, sometimes gland-dotted, while there are numerous, usually showy, stamens, mostly grouped into five or three bundles. The ovary bears three or five styles, and the fruit is usually a dry capsule, but in some species becomes berry-like.

The following key and descriptions will serve to distinguish the six species commonly met with outside gardens in New Zealand.

1.	Leaves 2 in. to 4 in. long, plant shrubby	2
	Leaves at most 1 in. long, plant herbaceous	3
2.	Flowers 3 in. across, styles five	*calycinum.*
	Flowers 1 in. across, styles three	*androsaemum.*
3.	Plant with erect stems	4
	Plant with trailing stems	5
4.	Plant robust, flowers numerous	*perforatum.*
	Plant slender, flowers few	*gramineum.*
5.	Leaves pointed at tips, margins with row of black dots	*humifusum.*
	Leaves rounded at tips, margins without black dots	*japonicum.*

H. calycinum (Fig. 1), Rose of Sharon, Aaron's Beard: A low-growing, semi-shrubby plant with numerous procumbent stems, forming dense masses covering the soil. Leaves about oblong to oval, dark green above and bluish-green below, 2 in. to 4 in. long. Flowers usually solitary, bright yellow, with large sepals and petals. The long, showy stamens are in five clusters with reddish anthers. The fruit is a dry capsule.

The species is a native of the Caucasus, frequently grown in gardens, and has been suspected of poisoning stock. In North Island it is an occasional garden escape, but is hardly naturalized.

H. androsaemum (Fig. 2), Tutsan, Sweet Amber: An erect-growing shrubby plant with numerous two-edged stems. The leaves are usually broader than those of the Rose of Sharon and whiter below, about 2 in. to 4 in. long, and more or less heart-shaped at the bases. The flowers are usually in groups of three to nine, a lighter yellow than those of the Rose of Sharon, and about 1 in. across, with less showy anthers. The fruit is berry-like, about the size of a pea, and blackish violet.

This European species is occasionally grown in gardens, and has become thoroughly naturalized in New Zealand, being plentiful in certain "bush-burn" country in both islands. It has also been suspected of poisoning stock.

H. perforatum (Fig. 3), St. John's Wort: This species spreads by means of underground runners. The stems are erect and branching and carry masses of flowers. The height varies from 1 ft. to 3 ft. or occasionally even more. The leaves are about $\frac{3}{4}$ in. long, unstalked, narrow, oblong, with numerous pellucid dots. There are several varieties, a narrow-leaved form, rare in New Zealand, appearing to be the commonest form in Australia. The flowers are borne in flat-topped clusters at the summit of the stems, the petals are of a rather deep yellow with black dots on the margins. The long yellow stamens are in three

FIG. 1. FLOWERING BRANCH OF *H. calycinum*, ROSE OF SHARON.

FIG. 2. FLOWERING AND FRUITING BRANCHES OF *H. androsaemum*, TUTSAN.

clusters, and there are three styles. The fruit is a three-celled capsule, with numerous seeds, dark brown, with rows of minute depressions.

This European species is now widespread in New Zealand, and is especially prevalent in certain hill-country areas in South Island. The underground runners (Fig. 4) make it difficult of eradication when once it is established, and the plant tends to dominate large areas. On cultivated land control is comparatively easy, and is discussed by Hughes (this *Journal*, May, 1915), who points out its heavy-seeding proclivities. On small patches salt applied after the plants have been cut close to the ground has proved effective in hot dry weather. A considerable measure of success has been obtained with sodium chlorate, using a solution of about 5 per cent. The possibility of control by insect enemies is under investigation.

Apart from its general objectionable features as a pasture weed, St. John's wort is distinctly under suspicion as a stock poison. Recently attention has been focused on it in connection with facial dermatitis

FIG. 3. FLOWERING BRANCH OF *H. perforatum*, ST. JOHN'S WORT.

in sheep. Seddon and White (Vet. Research Rep., 1927–28, Dept. of Agric., N.S.W., p. 106) have shown that St. John's wort when eaten by sheep produces photo-sensitization, followed by the characteristic

symptoms of facial dermatitis (see also Hopkirk in this *Journal*, February, 1936). The plant was found to be common in one of the areas in South Island, where outbreaks of facial dermatitis have occurred.

FIG. 4. *H. gramineum* (ABOVE), AND ST. JOHN'S WORT (BELOW), SHOWING THE UNDERGROUND RUNNERS.

H. gramineum (Fig. 4): This species rather resembles stunted *H. perforatum* but lacks the strong underground runners of that species. The stems are slender, seldom more than 12 in. long, the leaves are

FIG. 5. PLANT OF TRAILING ST. JOHN'S WORT, *H. humifusum*.

about $\frac{1}{2}$ in. long, about oblong in shape, with a somewhat heart-shaped and stem-clasping base, with many pellucid dots. The flowers are solitary, or, in well-grown specimens, in three-forked clusters. The petals are of a golden yellow, and smaller than those of St. John's wort.

This small species is a native of Australia and New Zealand. In this country it occurs in both Islands, being most plentiful in the lowland tussock grasslands of South Island. It is under suspicion as a photo-sensitizer.

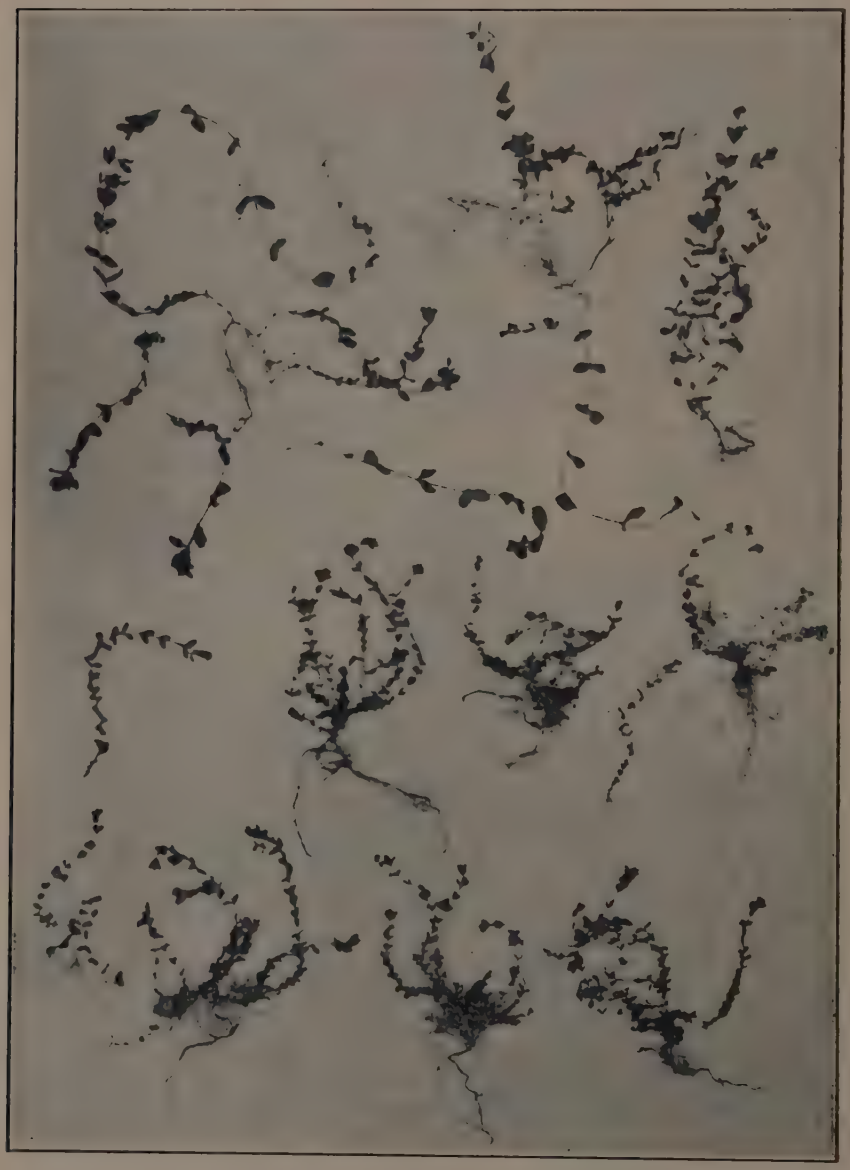

FIG. 6. JAPANESE ST. JOHN'S WORT, *H. japonicum*.

H. humifusum (Fig. 5). Trailing St. John's Wort: This is a very low-growing plant with numerous prostrate angled stems forming small close mats usually appressed to the ground. The leaves are oval,

bluntly pointed, about ¼ in. to ⅓ in. long, bluish-green with a distinct marginal row of black dots. The flowers are small, towards the tips of the branchlets, the sepals more pointed than in the following species.

This native of Europe is now naturalized in both Islands, and is plentiful in certain localities in North Island, especially on clay soils. Its powers as a photo-sensitizer do not appear to have been investigated.

H. japonicum (Fig. 6), Japanese St. John's Wort: Rather similar to trailing St. John's wort, but more delicate, with much less wiry stems and leaves with rounded tips, the margins without black dots. The leaves seldom more than ¼ in. long, often of a brown purple tinge; flowers usually solitary, sepals less pointed. A native of New Zealand, Australia, and eastern Asia. In New Zealand it is a frequent plant of moist ground, especially on the margins of swamps. In parts of South Island tussock grassland it forms a distinct girdle about the "lagoons" and ponds, and is frequent in certain of the areas subject to facial dermatitis. Feeding-tests are being carried out with it. (See article by Hopkirk, already cited.)

REFRIGERATION IN THE DAIRY INDUSTRY IN NEW ZEALAND.*

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BUTTERMAKING.

THE necessity for control of temperature in buttermaking has been recognized ever since the days when its manufacture was confined to the individual farm, and in the temperate zone those farms with a cold-water supply were, other things being equal, generally found to be the ones on which good-quality butter was made.

In the colder dairying countries of the Northern Hemisphere natural ice was used for cooling the cream, and the "Swartz" system of deep-setting of milk to allow the cream to rise is recorded in European countries in 1867.

In the "Swartz" method the milk was held in deep oval-shaped cans, which were placed in a large container with broken ice packed round them. After standing for twenty-four hours or longer, the skim-milk was run off through a tap at the bottom, and the cream was sent to a central butter-factory from farms and skimming-stations operated on this principle. Although the continuous-flow centrifugal cream separator was invented in 1878, the "Swartz" system was still in use in 1904 (Swedish Handbook, 1904), so that the fat losses in the skim-milk could not have been excessive.

As no natural ice was available in New Zealand, the earliest butter factories (1882) were equipped with a deep-setting method in which water took the place of the ice used in the "Swartz" system, but it can be understood easily that the fat losses would be excessive owing to the rapid coagulation of the milk in hot weather. The centrifugal separator was not then available, and there was no mechanical refrigerator which could be placed in the hands of the ordinary factory employee, and this,

* Paper read before the New Zealand Association of Refrigeration, Inc., February, 1936.

combined with the lack of refrigerated cargo space on overseas ships, was probably the reason why most of the early factories were equipped for cheesemaking.

THE FIRST SEPARATORS AND REFRIGERATORS.

The separator came into common use in butter-factories about 1890, but the cooling still depended on the water available, salt brine or ice procured from near-by freezing-works being used for cooling the water for butter-washing. Although some factories were equipped with refrigerators at that time, and these were used in a few instances for cooling water for washing the butter after it was churned, in most cases they were used only for cooling the rooms in which it was held overnight. Owing to the soft character of the butter churned at these high temperatures, the practice was to partially work and salt it when removed from the churn and to complete the working the following day. Churns at this period were simply an oblong box, and the workers in use were a circular revolving table with fluted rollers, the butter being turned by hand during the working process.

Butter made under these conditions was necessarily of poor quality, due to the high acidity of the cream at churning and the high curd-content of the butter, both of which materially affected the keeping-quality while the body and texture were poor and the fat-content of the buttermilk was at times over 5 per cent. This class of butter, while fairly satisfactory for the local market, was quite unsuitable for an export trade.

During 1896 a visit was paid to Australia by Mr. J. B. MacEwan, who was at that time in charge of the Dairy Division of the Department of Agriculture in New Zealand. Mr. MacEwan reported that "The success of the (Victorian) butter industry as compared with New Zealand is largely due to their adoption of adequate refrigeration in the factories, the heat of summer practically leaving no option, and therefore acting as an indirect benefit."

This report was no doubt the reason for the first recorded attempt to control the temperature throughout the buttermaking process, an attempt which was made by the Moa Farmers' Co-operative Dairy Co., Ltd., of Inglewood, which in 1896 despatched one of the directors to Australia in search of a suitable cooling plant.

The plant chosen by the Moa company was a two-stage Humble and Nicholson compressor of one-ton ice-making capacity, which had attached to it a cream-vat with direct expansion coils in the water-jacket, a similar coil for cooling water for butter-washing, a brine wall with coil for cooling the room in which the butter was held overnight, an ice-tank for making ice which was sent to the skimming-stations to cool the cream, which was then transported to the main factory in an insulated van with ice-pan.

From this date the ammonia compressor was practically the only type installed in butter-factories, the Humble, Linde, and Hercules being the three makes chiefly favoured. The installation and the equipment supplied with the machines was not suited to the requirements of the dairy industry, dealing as it did with comparatively high temperatures and short periods of time on different circuits, and the first few years after mechanical refrigeration was available were practically devoted to a determination of the best methods of utilizing the cooling plants installed.

CREAM-RIPENING.

Buttermaking was at that time carried out chiefly on the cream-ripening method, under which a comparatively high acidity was developed in the raw cream by the use of a pure culture starter. This required that the cream should be reduced from the separating temperature of about 100° F. to the ripening temperature of about 65° F., water coolers being used for this purpose. The starter was then added, and as the acidity developed the cream became more viscous. After reaching the desired acidity it was cooled to a churning temperature round 55° F. by means of coils in the water-jacket of the vats, which were rectangular in shape, or by the use of attemperators submerged in the cream. These were vertical coils through which chilled brine was pumped while they moved back and forth across the vats or horizontal coils which rose and fell. This was a long and expensive system, and in at least one of the earliest factories the ripening process was never adopted, probably because of the expense of cooling.

HOME SEPARATION.

The adoption of the home-separation system in the early 1900's made it necessary to add a neutralizer to the sour cream received in order to reduce the acidity and the viscosity, as it was found to be impossible to pasteurize the cream and cool it unless this was done, and an unpasteurized cream butter of such high acidity would not keep. This led to the general adoption of pasteurization, and the use of a starter in buttermaking was gradually dropped, and if used at all at the present time it is simply added to the cream without a ripening period being allowed.

CREAM PASTEURIZATION.

As a result there developed a system of buttermaking under which the cream was pasteurized and immediately cooled to churning temperature while passing over the coolers, and, in order to provide for the rapid reduction from a temperature exceeding 200° F. to about 38° to 40° F., chilled water or brine circulating through the last of a number of coolers was brought into use. It is doubtful whether the cost of cooling was increased as the result of pasteurization at these high temperatures because of the greater efficiency obtained by the adoption of these methods, and to the more fluid nature of the cream dealt with.

DIRECT EXPANSION CREAM COOLERS.

As factory outputs increased the capacity of the compressors in use was found to be insufficient, and in 1922 the first direct expansion ammonia cooler came into use. By its use greater efficiency was secured from existing refrigerating plants, but it has not proved an unmixed blessing, as it has been found to be one of the causes of lack of spreadability in New Zealand butter unless care is exercised in its use. Experiments have shown that where the cream is allowed to cool slowly—the practice followed when a ripening period was allowed—the butter made is more plastic even after being held in cold storage. Where "shock" cooling over direct expansion coolers is practised, especially where the cream is at a comparatively high temperature when delivered on to a cooler showing a hard frost, the butter is liable to be of a hard brittle nature and is difficult to spread. This is due, it is believed, to

the crystallization of the fat. It is suggested that to avoid this defect two direct expansion coolers should be used, the first to be regulated to give comparatively slow cooling, and the second to reduce the cream to the desired temperature for holding overnight. Although the temperature of the cream at churning may be the same by both methods of cooling the resulting butter has very different characteristics.

Firmness combined with plasticity in New Zealand butter commends it to users in hot weather, but lack of spreadability in cold weather is a frequent cause of complaint, as it gives a butter which is not economical in use, and this causes difficulties in institutions where buttered bread is served in large quantities. This defect was probably accentuated at this period by the practice followed in some factories of cooling the cream to a temperature as low as 34° F. and holding it overnight in vats which, in some instances, were not provided with water-jackets and coils, and in others without insulation also. The rise in temperature overnight due to summer conditions and to the latent heat in the cream was frequently as much as 12° F.

CREAM-VATS.

With the increase in the outputs of factories rectangular vats of 200 to 1,000 gallon capacity have been replaced by all metal circular vats of 1,000 to 3,000 gallons capacity, fitted with "staybrite" linings, water-jackets with ammonia coils and cork insulation, and the practice most generally followed is to reduce the cream to the desired churning temperature and cool the jacket of the vat just sufficient to maintain that temperature overnight.

These vats have brought with them the problem of the efficient stirring or mixing of this large body of cream in order to avoid uneven temperatures between that portion in contact with the cold sides of the vat and the portion in the centre with consequent uneven cooling of the fat which may cause increased fat losses in the buttermilk.

CHURNING-TIME.

The change from the older method of ripening the cream for churning, which is still practised in most dairying countries, and which produced cream of a high acid viscous character, to pasteurized unripened cream of a more fluid character, coupled with the adoption of the combined churn and worker, had a very far-reaching influence on butter-factory practice and on the quality and character of New Zealand butter.

Under the former system churning temperatures had to be maintained at a comparatively high point in order to avoid an excessive churning-time because of the viscous nature of the cream. As a result, the loss of fat in the buttermilk was comparatively high, there was a difficulty in freeing the butter from the buttermilk owing to its soft character when churned, and, in spite of at least two washings with water at a temperature of several degrees below the churning temperature of the cream, the finished butter contained a comparatively high amount of curd, which has a direct bearing on its keeping-quality.

After the adoption of pasteurization it was found that, owing to the fluid nature of the unripened cream and the consequent increase in the agitation during the churning process, temperatures could be reduced by 10° or more below the former figure without unduly prolonging the

churning period. As a result, the fat-content of the buttermilk was reduced, only one washing was required, the curd-content of the butter was also reduced, and the keeping-quality correspondingly increased.

THE COMBINED CHURN AND BUTTER WORKER.

The early churns of the combined type were procured from countries where churning temperatures were comparatively high, and the butter when churned was consequently of a soft spongy nature and retained a large percentage of water. A slow churning speed of about thirteen revolutions per minute was necessary in order to finish with the butter in a granular form, and in order to avoid reaching the maximum legal water-content of 16 per cent. before the working process was complete it was necessary for the barrel to travel at a slow speed to allow the water to drain out while carrying the butter up on to the workers. The working speed was about one and a half revolutions per minute, which would require up to forty-five minutes to work the butter if the cream were reduced to the low temperature in use to-day.

By reducing the churning temperatures of the more fluid pasteurized cream it was possible to increase the churning speed to twenty revolutions per minute, and the butter when churned is now of a hard, dry, granular character, and free from buttermilk. The working speed was increased to about three revolutions per minute, thus reducing the time for working to about ten minutes, and thereby increasing the amount of work which can be done by each churn daily. To meet this change in temperatures it has been necessary to provide much heavier construction and driving-gears in churns imported to New Zealand, and as time went on the type now in use which churns from fifty to sixty-five 56 lb. boxes of butter instead of fifteen to twenty boxes as formerly has been evolved. These churns are all made in New Zealand.

VARIATIONS IN CHARACTER OF BUTTERFAT.

Under these conditions it is possible to alter the churning temperatures to suit the varying character of the butterfat produced in different districts and at different seasons of the year. Thus, it may be necessary to reduce the temperature of the cream to 40° F. in one district and to only 50° F. in another, while there may be several degrees difference between spring churning temperatures when the fat globule is large and soft and autumn temperatures when it is small and hard, even in the same districts.

The aim of the buttermaker is, then, to regulate the churning temperature of his cream so that the butter is churned in about forty-five minutes and that the moisture-content of the finished butter will reach 15·7 to 15·8 per cent., when his judgment tells him that the working process is completed.

INFLUENCE OF CHURNING TEMPERATURES.

Should the temperature be too high the churning-time will be reduced, the butter will be soft, and the water-content will reach the maximum before the salt and moisture are evenly distributed, and the butter will probably be streaky and leaky—that is, showing free moisture.

Should the temperature be too low, the butter will be hard and the working process will have to be carried on until it has become soft enough to " take up " the moisture, and the finished butter will probably have a greasy texture.

MOISTURE-CONTROL.

Control of churning temperatures in conjunction with the combined churn and worker has given a control of the moisture-content of New Zealand butter which is purely mechanical, and has raised it from about 10 per cent. in the early days of the industry to an average of 15·535 per cent. for the whole of the Dominion for the year 1934–35, or approximately 10,000 tons of butter on an output of 165,000 tons.

SALT-CONTROL.

Temperature-control has also made it possible to standardize the alt-content of New Zealand butter more accurately at whatever figure is desired. Butter churned at a high temperature retains a larger quantity of water in the soft spongy mass after the wash water has been run off than does the butter churned at a low temperature. The quantity of water in the first instance is usually in excess of the amount required to reach the legal limit in the finished butter, and consequently the excess must be run off at some stage of the working process, with the result that some of the salt is carried off with it. Where the churning temperature varies this may result in a difference of $\frac{1}{2}$ per cent. in the finished butter between two churnings, although the same percentage was added to each. This has three disadvantages—loss of weight of the finished butter, waste of salt, and irregularity of salting, which is undesirable from the distributors' point of view.

MAKE AND KEEPING-QUALITY.

Two points of the greatest importance were recognized in the very early stages of the industry by New Zealand buttermakers. The first was the importance which temperature-control played in making it possible to obtain an even distribution of the other ingredients in the fat, and thus to produce butter which was well made, or, in other words, firm in body, smooth in texture, and of uniform composition and character. It is generally accepted that New Zealand conditions admit of the production of butterfat which is of such a character that the body and texture of the butter is the envy of the dairying world, and full advantage has been taken of that fact by makers.

The second was the importance which these characteristics played in keeping-quality, a point which was not recognized by many dairying countries having a domestic or near-by export market, but which is of the greatest importance to New Zealand, which depends on seasonal production and on overseas markets that entail long periods of storage to give "spread" delivery.

In actual fact, mechanical refrigeration was used in the dairy industry in the Southern Hemisphere at an earlier stage than in those countries where natural ice was available, and was applied much more intensively as indicated by articles dealing with "Leaky Butter," "The Keeping-quality of Well-worked Butter," and others of a like nature which appear in dairying journals of other countries.

CHEESEMAKING.

Refrigeration does not play such a prominent part in cheesemaking as it does in buttermaking, and, as already stated, it was probably this fact which was the cause of most of the early factories taking up cheesemaking.

The availability of a supply of cold water had, however, an equal influence on the quality of the cheese made on the farms, as the rate of development of the acidity during making depended largely on the condition of the night's milk when the rennet was added next morning. It was for this reason that milk was received twice daily, and in some instances morning's milk only was received by some of the early factories.

While cool conditions were provided on some farms by using a cellar for a cheese-curing room, similar conditions were obtained in other instances by the use of caves for this purpose.

The earliest factories built in New Zealand, however, had an upstairs curing-room in many instances, some being immediately above the making-room, and this practice is still followed on the farms and in factories in Britain.

COLD-CURING.

In 1903 experiments were carried out on the cold-curing of cheese in Canada, and the conclusions reached were that the quality of the cheese was much improved, while loss from shrinkage was reduced.

In 1907 the Department of Agriculture collaborated with the Dalefield Co-operative Dairy Co., which installed a refrigerator in the curing-room at their factory, and, while the results were satisfactory, the practice was not continued, due probably to the fact that the rooms were not properly insulated.

INSULATION AND COOLING OF CURING-ROOMS.

Provision for cooling has been made from time to time in a number of factories, but has not been regularly used, although most of the curing-rooms built in recent years in the North Island and some in the South Island have been insulated. In these, advantage is taken of the cold night air by opening the louvred windows which are placed between the rows of shelves on opposite sides of the room, which is usually built so that no other part of the building obstructs the passage of air on either side. During the day these windows are closed.

The hot summer of 1934–35 impressed cheese-manufacturing companies with the necessity for more attention being given to the control of the temperature of curing-rooms, many of which exceeded 80° F. during the day, which caused the fat in the cheese to melt, and complaints of gritty, sandy body were very numerous in reports received from Britain. As a result a large number of rooms have been insulated with cork and other materials, and a lesser number have been equipped with refrigerators, most of them being automatically controlled. Provision of this type will probably be recognized in the near future as necessary in all curing-rooms.

STORAGE OF MILK SAMPLES.

Another use for mechanical refrigeration in the cheese industry is the provision of cooling-units for the storage of milk-samples in those factories which have taken up the question of payment for cheese milk on yield. It has been found that where these units are used the samples of milk can be kept for the required ten-day period in satisfactory condition for testing for casein by the Walker method, and from this result and the fat test the yield of cheese can be calculated. Such cooling-units have been installed in a number of factories during the current season.

The methods of application of refrigeration during storage at the port of shipment and on overseas ships have been greatly improved during recent years, but the varying condition of cheese cargoes landing in Britain indicates that there is still room for improvement.

From the foregoing it will be seen that even apart from the dependence of the New Zealand dairy industry on refrigeration for the delivery of its products on overseas markets, it plays an essential part on the manufacturing process in buttermaking and a lesser one in cheesemaking; but there is another possible sphere of usefulness which yet remains to be exploited—namely, the provision of a cheap and efficient means of cooling milk and cream on the farm, whether it is to be used for manufacture or for city supply.

SPECIAL CROPS FOR USE IN PIG-KEEPING.*

FARM EXPERIENCE IN MANAWATU DISTRICT.

R. P. Connell, Fields Division, Department of Agriculture, Palmerston North.

Survey of General Position.

In assessing the potential value of special forage crops for general use in pig-meat production considerable assistance may be obtained from a knowledge of the different current practices and of the results of these practices.

In the statements which follow, the farmers considered are primarily those engaged in pig-meat production as a side-line; those engaged principally in the breeding of stud animals and those supplementing the normal supplies of feed by supplies of buttermilk or of whey obtained from external sources are not taken into consideration. Of dairy-farmers considered, there are a relatively small number who are obtaining satisfactory financial returns, and a large number whose returns in comparison with the satisfactory ones just mentioned are distinctly disappointing. A measure of the differences in the results of those whose financial returns are satisfactory and of those whose returns are disappointing is provided by comparing the data relative to the farmers embraced in the 1935 report of the Manawatu-Oroua Pig Development and Recording Club with corresponding data relative to typical farmers of the same district as indicated in the survey made by the Department of Agriculture and recorded in the report of the Dairy Industry Commission. In the 462 litters covered by the report of the Pig Development and Recording Club, the average number of pigs weaned was seven, and incidental evidence indicates that in the majority of cases two litters a year were obtained. Hence it would seem that at a modest estimate about twelve pigs were reared from each sow in the year. Against this, on the seventy-three farms covered by the survey recorded in the report of the Dairy Industry Commission only 6·4 pigs were obtained from each sow in the year. That the operations on the seventy-three typical Manawatu farms compare favourably with those of Dominion farms generally is clear from the following facts: in the Dominion as a whole last year 4·2 pigs were slaughtered for every ten dairy cows; on the seventy-three Manawatu farms 5·8 pigs for every ten cows.

* Portion of an address to the Manawatu-Oroua Pig Development and Recording Club.

It is most significant that those who are securing quite satisfactory returns from pig-meat production fall into three distinct groups, whose returns in a general way vary according to the extent to which they employ farm-grown feed other than dairy by-products.

Group 1 consists of those who breed and rear to slaughter-stage practically all the pigs which are sold off their farms. Their purchases of pigs are confined almost wholly to breeding-animals and are designed to maintain or improve the standard of their stock. Their purchases of feed are also very limited. One Manawatu farmer of this group produced 66 lb. of pig-meat per 100 lb. of butterfat, and his outlay on purchased feed was less than 5s. per pig sold.

Farmers of group 2 correspond with those of group 1 in their operations, which, however, are supplemented by an important additional feature. This is the sale of weaners, and, normally, the greater the extent of this the greater is the consumption of farm-grown feed other than dairy by-products. Further, the greater the extent of the weaner sales, the more satisfactory are the returns.

Group 3 goes a step further than group 2 in that it does all that group 2 does and in addition buys in stores when they are cheap. These stores during periods of scant supply of by-products are fed on farm-grown feeds. The returns of farmers belonging to group 3 are more satisfactory still than those of group 2, and the proportion of farm-grown feed other than dairy by-products used is the highest of all. In the 1933–34 season one farmer of this group from pig-keeping grossed over £6 and netted £4 4s. per cow milked.

A fact of basic importance is that farms of group 2 and group 3 are not self-contained units. Both exploit the improvidence of their fellow-farmers: group 1 by selling pigs (mostly weaners) when they are unduly dear, and group 2 by selling pigs (weaners usually) when they are unduly dear, and again by buying pigs (stores and possibly weaners) when they are unduly cheap. The point of practical importance is that both groups are enabled to exploit the improvidence of their fellow-farmers mainly by the use of feed other than dairy by-products grown on the farms. The question of practical moment is, What feeds have been used for this purpose?

Value of Pastures Demonstrated.

Field experience shows that in this district grass may be employed with marked success when judged on the basis of net returns. This statement does not apply necessarily to the feeding of grass to pigs being prepared for slaughter. About this our knowledge is incomplete, but available evidence points to the possibility that in respect directly and exclusively to economy of nutriment not a great deal, if anything, is to be gained by grazing such pigs.

But the value of grazing for breeding-animals and for young pigs has been so well demonstrated in this district as to be beyond doubt. Extensive field practice has shown conclusively that breeding-animals can maintain themselves in good condition on good grass alone. By using grass for the maintenance of breeding-animals a greater amount of the dairy by-products becomes available for the production of pig-meat for sale. It is generally agreed that pig-meat production to be economical in respect to the amount of feed consumed calls for the use of concentrates, and so it becomes of practical moment to bear in mind that

skim-milk is a concentrate—a diluted one certainly—but nevertheless, in essential features a concentrate, and to bear in mind, further, that concentrates, being of such special value, should be replaced by inferior feeds when this is possible. The practical application of all this is that pigs should be maintained as much as possible on grass, &c., and that as large a proportion as possible of the dairy by-products should be used for rapid meat-production. Successful results from the feeding of grass in the Manawatu are being obtained from adopting to a considerable extent but, as a rule not wholly, the extensive system of grazing as distinct from the intensive system which involves the use of small paddocks exclusively in the manner which has been advocated at times.

Two features of the use of grass by pigs calls specially for attention: (1) The best results are dependent upon the grass being of really good quality—young and leafy; (2) the supply of grass must be adequate. In respect to the provision of grass, the requirements of the pig probably are, at times, underestimated. They may be gauged from the following data taken from Marshall and Halnan's "Physiology of Farm Animals": The joint maintenance requirement per day of two pigs of 250 lb. live-weight is approximately 5 lb. of starch-equivalent—some of the sows which were weighed at Massey College and which were not considered abnormally large were of 500 lb. live-weight; the maintenance requirement per day of a 1,000 lb. Ayrshire cow is 5 lb. of starch-equivalent, and that of an 800 lb. Jersey is 4·3 lb. starch-equivalent. These data enable the pigs' grazing requirements to be assessed relatively and at the same time indicate the substantial saving of dairy by-products for rapid flesh-production that is effected by maintaining breeding-animals as much as possible on grass.

Causes of Unsatisfactory Results in Grazing.

Unsatisfactory results from grass are not infrequent, and they are due almost invariably to lack of quality or of quantity or of both in the grass. Especially does the lack of quantity operate in the winter and early spring. A marked weakness of our farming is inadequate supplies of grass for dairy cattle in the winter and early spring. To add pigs to the consumers of grass during this period is simply intensifying a common weakness.

The Role of Special Forage Crops.

The remedy is the growing of special crops, including such ones as mangels, carrots, swedes, chou moellier, pumpkins, peas, barley and maize for grain, and lucerne, cereals, and temporary pastures for green feed.

In this connection a general question of basic importance is the cost of growing such crops. It is not merely futile but misleading to consider this matter of costs as involving an application of simple book-keeping to crop-production. For instance, to set down a string of items such as ploughing, disking, drilling, harrowing, weeding, rent, &c., as the cost of producing a crop of mangels may be an interesting academic venture, but unless there are actual payments relative to such items, then such a proceeding is of negative practical value, if taken seriously—of negative value because it gives as the cost of the crop an amount which really is not the cost.

To simplify consideration of this matter, mangels correctly may be taken as a typical crop. In practice the cost of a crop of mangels under the farming-conditions being considered consists of two main parts: (1) Direct payments covering material and labour used in raising the crop; (2) the net value of what alternatively would be produced from the land with the labour and equipment customarily provided on the farm.

This being so, the cost of a crop of mangels varies greatly from farm to farm. For instance, on some farms the growing of mangels may call for considerable direct payments for labour. On the other hand, on many farms, indeed on most farms, the current provision of labour and equipment allows of a crop of mangels being grown. This position is true of the other crops mentioned. Hence, in actual practice, one farmer correctly may be advised not to grow special crops for pigs while neighbouring farmers may be well advised to grow such crops because of the difference in costs. The latter farmers greatly predominate in this district.

In brief, farmers individually must decide for themselves the matter of special-crop production. And, in doing this, they must avoid fictitious items of cost originating in academic considerations. A most important fictitious item often is that covering the cost of replacing a pasture broken up to provide an area for a special crop.

On most farms there are pastures which should be broken up and resown in the interests of their future production as pastures and apart altogether from any considerations relative to special crop-production. If, in doing this, a special crop which pays or more than pays for itself can be grown as an intermediate step so much the better, but to charge against this crop the cost of resowing the pasture is weighing the case unjustifiably against special crops.

Feeding-value of Mangels and Similar Crops.

As at times doubt is expressed about the suitability of mangels and similar crops for feeding to pigs, it is as well to consider what has been established. Probably the greatest amount of work and certainly the pioneering work in this matter has been carried out in Denmark largely under the direction of N. J. Fjord. Harold Faber sums up this work in the following statement: "The feeding trials conducted by N. J. Fjord . . . had, then, in the course of a few years given definite answers to the questions as to the feeding-value of roots. They had shown that roots had a considerable value; that roots could replace corn and oil-cake in the food of both cows and pigs without changing their growth or the production of milk . . . On weighing in some of the experiments the amount of water drunk by the cows, it was found that the cows fed on roots drank less water, and that this decrease was about equivalent to the amount of water contained in the roots they consumed. It has, further, been clearly established by these experiments that different varieties of roots have different feeding-values, according to their varying amounts of dry matter or total solids, that the different strains within the same variety have different contents of dry matter, and therefore different feeding-values. . . . As a general conclusion it has been proved that 1 lb. of dry matter in roots has the same feeding-value as 1 lb. of corn, or is equivalent to 'one unit of food.' In the 30th report it was found that pound for pound the dry matter

in mangels and carrots had the same feeding-value for pigs; in the 42nd report it was found that pound for pound the dry matter in Yellow Tankard and Bullock turnips and in Bangholm swedes had the same feeding-value for pigs as the dry matter in Eckendorf mangels; in the 53rd report it was found that 1 lb. of dry matter in mangels had the same feeding-value for milch cows as 1 lb. of corn when fed in the usual mixed fodder."

The Cambridge School of Agriculture gives the following figures relative to the average dry-matter content: Carrots, 13 per cent.; mangels, 13·2 per cent.; swedes, 11·5 per cent.; turnips, 8·5 per cent.; chou moellier, 14·8 per cent. While these figures may differ to some extent from New Zealand ones, they enable interesting comparisons to be made. For instance, it may be deduced from them that a 60 ton crop of mangels has the same feeding-value as the grain from 7 acres of a crop of barley yielding 50 bushels to the acre, or of 4 acres of a crop of maize yielding approximately 90 bushels to the acre. From such a comparison one can well understand the great role played by root crops in the farm economy of the Danes, who at an early stage established that roots in essential respects really are diluted concentrates.

The reference to the water-content of roots in the above quotation from Faber is of some practical moment because of the occasional tendency to discount the value of certain feeds to an unjustified extent on the score of their bulkiness. Actual farm experience shows that when high digestibility is linked with bulkiness, then mere bulkiness does not impair the feeding-value to the extent that some seem to expect. An instance of this is provided in the feeding of skim-milk to pigs; a more striking instance is the feeding of whey, the dry-matter content of which is substantially lower than that of, say, mangels or swedes. A further instance is the feeding of soft turnips to dairy cows: the splendid results obtained in the late summer from the turnip are due primarily to its equivalence to a concentrate in respect to digestibility, its content of dry matter being relatively poor.

Crops which may be Grown.

In respect of such important crops as mangels, chou moellier, swedes, carrots, and cereals, or temporary pastures, provision for the requirements of pigs often may be made readily by merely adding to the areas which are grown to meet the requirements of other classes of stock. However, if it is not considered necessary to grow carrots and chou moellier for the latter it may nevertheless be advisable to grow them on special areas for pigs for use prior to the mangels becoming mature enough for use.

In practice, lucerne has been found of special value for pigs as a summer grazing crop, and for this particular purpose it would often be well to have a special area separate from the area which is devoted to the needs of other classes and which ordinarily should be grazed to the minimum extent practicable.

Subterranean clover is a grazing crop which gives great promise of becoming specially valuable over wide areas, and particularly so on soils of medium to poor fertility. This is well illustrated on the western sandy coastal belt of the Wellington Province and on the rolling heavier soils of the Manawatu.

Pumpkins have been tried with indifferent results. The quality of the feed is unquestionably good, but the appearance of the crops is deceiving in respect to their yield. Crops which were considered by farmers to be heavy ranged from about 15 tons to 30 tons an acre, whereas they were deemed to be much heavier. The pumpkin is serviceable for use before the mangel is mature.

Of maize for grain it may be said relative to Manawatu and similar districts that it is not dependable enough: this applies to varieties which are considered of early maturity, such as Minnosota No. 13, and Early Butler, as well as to other varieties. On the other hand, in warmer, more northerly districts maize is being used most successfully. The amount of experience with sugar beet, which is distinctly limited, suggests that yields are likely to be so small that the superior quality or feeding-value per ton does not compensate for the low tonnage.

Two crops that prove of special value for feeding to pigs are barley and peas: the grain from these are found to be good companion feeds for use with mangels, &c.

Barley.—In this district barley for grain has been grown principally on the rolling country on which Chevalier is most favoured for grain-production. The growers say that this is because (*a*) it is consistently a good cropper—*e.g.*, 40 bushels to 60 bushels, average, say, 45 bushels; (*b*) sowings may be at relatively late date (sowings mid-October to first week in December); (*c*) it does not "shake" even if allowed to become practically ripe before cutting. This is a distinct advantage, because it allows of cutting with a mower and early subsequent saving as hay. On the richer level country good results have followed the use of Cape barley.

Peas.—The preference is for Grey Partridge as a more consistent cropper than Blue Prussian, which is considered to have a greater tendency to stalk-production in showery weather.

For pig-keeping both barley and peas call for no special equipment. They may be cut with mower, stacked as hay, and threshed by pigs. This is of much moment, as special outlay in equipment is thereby obviated.

The position as described above is summed up in the following statements:—

(1) Pastures suitably managed have proved of outstanding value in pig-keeping.

(2) Often the feed available from pastures becomes unduly scant at certain periods of the year.

(3) A wide range of special crops, such as mangels, carrots, swedes, barley, and field-peas, has been found to be of distinct value in pig-keeping in supplementing the feed available from pastures.

(4) The good feeding-value of certain bulky crops, such as swedes and mangels, lies in the fact that they are diluted concentrates.

(5) The economic advisability of using special crops in pig-keeping depends on the cost of producing them, and this in its turn varies greatly from farm to farm; hence each farmer's decision must be based on consideration of his own particular circumstances.

(6) In assessing the cost of special crops care should be taken to avoid the inclusion of fictitious items of cost originating in overlooking the fact that the farm as a whole is the working-unit.

TUBERCULOSIS IN FARM ANIMALS.

T. A. BLAKE, Veterinarian, Hamilton.

TUBERCULOSIS is a contagious disease characterized by the formation of tubercles or small nodules in the affected body tissue, these tubercles being formed by the action of the causal organism commonly known as the tubercle bacillus.

Along with other bacteria such as streptococci and staphylococci, the tubercle bacilli represent a group of very lowly vegetable organisms.

Horses, cattle, sheep, pigs, dogs, cats, and poultry are all susceptible to the ravages of this disease in varying degree, cattle and pigs being the stock among which tuberculosis is most common.

Tuberculosis is a disease of the greatest importance, not only from the fact that it causes serious loss to many farmers whose stock are affected, but also because, owing to its marked prevalence in cattle, there is grave risk of the disease being communicated to mankind through the ingestion of milk drawn from infected cows.

The danger incurred to the human being through the consumption of tuberculous meat is largely overcome in the process of cooking, apart from the fact that it is an offence to knowingly allow diseased meat to be used for human consumption.

From very early times animal tuberculosis was considered to be communicable to man, rules for preventing the ingestion of infected flesh occurring in Mosaic laws.

It has been suggested that infection with the bovine type of the tubercle bacillus confers an immunity on the human being so that he is more able to withstand the evil effects of infection with the human type, but surely the better plan is to act so that the human family, in the shape of the young child, shall not be given the opportunity of becoming tubercular from either source.

There are many diseases of stock which defy the greatest efforts of elimination, mammitis and abortion being two well-known instances, but tuberculosis is just one that could be eradicated from our herds in course of time by testing and culling.

In many districts the various farmers lose only an odd cow every year or two, or even far less often than that, and are not alarmed by the occasional loss, but in some districts the disease assumes quite large proportions and occasions serious loss by the condemnation of stock both on the farm and in the slaughtering establishments.

At the moment pig-raising is receiving increased attention in this country, and many farmers have spent much money and time on it, but very few can be sure that they are not laying the foundation for wholesale condemnation of their pigs at the freezing-works because of the possible use of infected milk given morning and evening.

The United States of America has tackled the control of tuberculosis in live-stock, and is doing wonderful work in gradually getting rid of the scourge, the remarkable point being that other countries did not take similar steps long ago.

When it is known that English and Scottish research demonstrated that of 365 children under five years of age affected with tuberculosis, over half these cases yielded the bovine type of bacillus, it seems that at least all herds supplying milk to households should be tested, and the possible cause of suffering to so many should be removed. It has been estimated that in England and Wales there are 4,000 fresh cases of infection with the bovine bacilli every year, and some 2,000 deaths annually occur in human beings.

Many of the English County Councils now have veterinarians on their staffs mainly for the purpose of examining cows. These men undoubtedly do good work in the elimination of detectable cases of tuberculosis, but the testing and eradication of all infective animals is surely the only way to successfully combat this disease.

Fifty-three years ago Koch discovered the specific micro-organism which causes tuberculosis, and from then up to the present time workers have been engaged in the investigation of the disease in all its aspects.

The geographical distribution of tubercle is world-wide, its prevalence apparently being unaffected by climatic influences. Jersey cattle are said to be free from infection when in their native country, but, when exposed to infection, they succumb as do all other breeds.

In days gone by hereditary transmission was regarded as an important etiological factor in the occurrence of the disease under consideration, but it is now known that the hereditary nature of tuberculosis may practically be neglected, exceptionally few animals being infected at the time of birth.

The tubercle bacillus is regarded as an obligatory parasite, which implies that it does not multiply outside the animal body. This is a very fortunate characteristic for us all, because it allows the spread of the disease to be controlled far more easily than if the organism led a saprophytic existence and was able to multiply its species in soil or pasture.

Another important feature in the control of this disease is that exposure to sunlight destroys the bacillus in a matter of some hours: thus the organism does not maintain its vitality and its infective power for a lengthy period on pastures fully exposed to the sun. Recent research, however, has shown that tubercle bacilli are extremely resistant to the external conditions, virulent organisms having been recovered from cow-manure for a period of more than two years. This would indicate the advisability of frequent harrowing and breaking up all clods of manure on the pastures in order to let the sunlight do its beneficial work in this direction. Advice is given not to allow pigs to run in paddocks grazed by cattle infected with the disease, for the reason that the pigs may contract the disease by rooting about even though cows have not been in the paddock for some considerable time.

The small paddocks in which pigs are now frequently kept are splendid from this point of view, but it must be remembered that calves which may be drinking infective milk should not be allowed in the pigs' pens.

Pigs may also pick up the bacillus from pasture or ground over which tuberculous poultry roam, and therefore these two species of animals should not be allowed to run together if tuberculosis is suspected amongst the poultry.

In some parts of England it has been estimated that about 40 per cent. of the dairy cows are tuberculous, but in New Zealand the position is much more fortunate, this smaller occurrence probably being largely brought about by the open-air living and the abundant sunshine enjoyed by our stock but not appreciated by the tubercle bacillus. The administration of the Stock Act has undoubtedly played its part in the prevention of spread of this disease. The enlightenment of the farmer and his knowledge concerning tuberculosis, combined with his very sensible readiness to report and cull suspected animals, have been a most important factor in the suppression of what might have become a far more serious problem had the owners of our herds been apathetic and negligent in this matter.

Three different types of tubercle bacillus are known to and can be identified by the bacteriologist, these types being the human, the bovine and the avian type.

The various distinguishing features need not be recounted here, but it might be interesting to mention that inoculation into a calf will distinguish the bovine from the other two types by the acute and progressive lesions set up in the calf by the bovine bacillus. The fowl is very suspectible to the avian type, but is rarely affected by the human or bovine type. Our fireside companion, the cat, is particularly resistant to the human and avian types, but will readily contract generalized tuberculosis when inoculated with the bovine strain. Man's best friend, the dog, is markedly resistant to all three types of the micro-organism which causes this serious affection. Horses and sheep are so rarely affected that the disease in these animals merits very little attention by inspecting officials or by the general public.

Regarding tuberculosis in the dog, Henry Gray, who had a vast experience of work among dogs in London, wrote: "It is not a rare disease in the dog, although it is encountered in him less frequently than in the cat. Very frequently it has silently progressed to an extensive degree before the animal shows any serious manifestations of its ravages, and in many instances it is not suspected until a post-mortem examination is made. From a public health point of view it is important to recognize the disease early, as it may become a dangerous menace to the health of human beings in contact with such animals." He further states that raw meat or offal or unboiled milk from tubercular animals are possible sources of infection, but he believes the commonest source is that from mankind.

From observations made by a clinician such as Gray, it is apparent that infection from man to dog or cat is feasible, and that the possibility of infection passing from the animals to those who handle them is not wholly negligible. In this country, however, tuberculosis of the dog seems to be rare.

The common channels of infection of stock are the mouth and the nasal passage, the tiny bacilli, which measure about one-eight-thousandth part of an inch in length, gaining entrance to the alimentary canal with the food, or to the respiratory system during inhalation of infective air.

In the case of calves and pigs the milk from infected cows is undoubtedly the chief agent by which tuberculosis is spread amongst these animals.

One striking instance of the danger of virulent milk occurred locally in which every calf in a large herd was infected. In this outbreak some calves died and some were seriously affected, but the whole lot had to be disposed of. This loss to the farmer was probably due to one or more cows having tuberculosis of the udder, large quantities of virulent bacilli thus gaining entrance to the alimentary canal of the calves by way of the milk. This loss could have been avoided.

At slaughtering-places large numbers of pigs are found to be tuberculous, and many have to be condemned either wholly or partially in consequence; thus it behoves those who feed pigs or calves to take some steps to prevent wholesale infection of these young stock.

Undoubtedly the best way to tackle this question is to have all dairy cows tested and the reactors culled, but some method of pasteurizing the milk as it comes from the separator would overcome the danger until the time when the eradication of tuberculosis from our herds is undertaken. A pasteurizing plant of this nature would have to be cheap and efficacious; but it has been found that a combination of these two attributes is not an easy matter in this instance because of the quantity of heat required to raise the temperature of the milk to pasteurization point.

A striking object-lesson in the value of giving pigs milk free from virulent tubercule bacilli was seen by one farmer many years ago in this country. He installed a plant for pasteurizing his separated milk before feeding it to his pigs. He obtained a pasteurizer, but unfortunately this, owing to the ineffectiveness of his factory boiler, did not give satisfaction in working and it was removed, a system of heating the milk by direct steam being substituted. This did not enable him to raise the temperature to the standard accepted as necessary, but it was held at a lower temperature for a considerable time. Even with this inadequate appliance the results were most startlingly gratifying.

Of 223 pigs killed just before the pasteurizer was installed there were 154 found to be infected, but of 104 pigs killed when the milk had been rendered practically harmless there were found only three pigs with tuberculosis and two of these were very slightly affected.

If a farmer has a large percentage of his pigs rejected on account of tuberculosis at any slaughtering establishment he should take measures to prevent a recurrence of such loss. These measures may be simply a clinical examination of his cows and sows, coupled with the culling of affected animals, and further examination of any showing suspicious symptoms, or they may involve the testing of the cows and the sows.

It cannot be too strongly stressed that if the milk fed to pigs were free from virulent bacilli the condemnations of pork and bacon carcasses would fall to a figure very much more satisfactory to the farmer and to the country generally.

Most farmers are able to recognize a tuberculous cow, but the common symptoms or clinical manifestations of this disease in

cattle may be stated briefly as follows: (1) Persistent cough; (2) enlargement of a lymphatic gland; (3) general unthrifty appearance. A beast may exhibit one or all of these symptoms according to the nature and location of the disease in the particular case.

If the enlarged gland is situated inside the throat a distinct roaring noise is often discernible when the animal inspires. The other situations in which glands may commonly be seen affected are below the ear, on the shoulder, in the loose skin just where the thigh and flank are adjacent, and in the upper posterior part of the udder, the glands in these locations being sufficiently superficially placed under the skin to be noticeable when enlarged.

Unfortunately tuberculosis of the udder develops in a slow insidious manner, a hard and painless swelling later appearing in one or more quarters, while, at an early stage in the course of the mammary affection and while the milk appears quite normal, tubercle bacilli are being excreted in the milk. Therein lies the danger to the human subject, to the calf, and to the pig. In this connection it must not be forgotten that milk may be contaminated from the droppings which have adhered to the hind quarters or tail of a cow.

Diagnosis of tuberculosis in the live pig is not usually an easy matter, probably the most characteristic symptom being a swelling in the region of the throat, when the submaxillary glands may be found enlarged. In the case of sows the udder should be examined. In one seriously affected litter of pigs the brain material became the seat of tubercular lesions, which caused the young swine to stagger about as though intoxicated.

Amongst poultry, tuberculosis is a fairly common complaint, and may be met with in fowls, turkeys, parrots, and other birds. The symptoms in a fowl are not always characteristic, but general debility, anæmic wattles and lameness may suggest tuberculosis. The lesions in poultry are mostly confined to the digestive apparatus, the liver presenting numbers of yellowish-white nodules. A tuberculous lesion of the foot of the fowl is popularly known as "bumble-foot."

In parts of the United States of America where the poultry and swine industries are very great, avian tuberculosis exists to a considerable extent. It has been estimated that perhaps 90 per cent. of the swine that show symptoms of tuberculosis on autopsy originate in the section of the country where the avian type is prevalent. It will thus be seen that tuberculosis of the fowl is of some importance, more especially in connection with the pig industry.

Just lately the process of immunization of calves has been brought to public notice on account of the trial with Sphalinger's vaccine in Northern Ireland. Presuming that this vaccine, or any other vaccine, can be manufactured and used economically in the future, there are still thousands of cows in the country which are a potential source of infection to pigs, calves and other cows, and these dangerous cows should be removed from the herds.

A report of the special committee on tuberculosis submitted at the annual meeting of the American Veterinary Medical Association in 1935 illustrates the stupendous amount of work undertaken in connection with the live-stock in that country. This ambitious scheme calls for the expenditure of a colossal amount of energy, time, and money. Nothing daunted by the formidable nature of the task, the United States veterinary authorities are determined to accomplish it, and figures show how far they have succeeded.

The report states that during the year ended June, 1935, the number of cattle tested was over twenty-five million. Of this number 1·5 per cent. reacted to the tuberculin test and were removed from the herds.

The result of these indefatigable labours will ensure a freedom from bovine tuberculosis among the human and animal population, and will, in the end, provide a guarantee of the soundness of edible animal-products in America which will be the envy of the rest of the world.

New Zealand could not put forth such gigantic effort as has been demonstrated in America, and, naturally, it would not be required; but it might be possible in the near future to carry out some plan of elimination in certain areas as a preliminary step to greater things.

EXPERIMENTS WITH TWO ORGANIC-MERCURY SEED DUSTS.

AGROSAN G AND CERESAN (U.T. 1875).

J. C. NEILL, Field Mycologist, Plant Research Station, Palmerston North.

THE experiments detailed below were designed to provide information on the effect of the two organic-mercury seed dusts at present available in New Zealand, Agrosan G and Ceresan (U.T. 1875), on seed of wheat, barley, and oats in regard to plant establishment and control of disease.

Naturally infected samples of Solid Straw Tuscan wheat, Cape barley, and Algerian oats were divided into three parts—one dusted with Agrosan G, another with Ceresan (U.T. 1875), both at 2 oz. to the bushel, and the third left without treatment. Four-rod rows of 100 seeds each were sown from each lot, at approximately weekly intervals, from early autumn to late spring, in three plots of varying-soil type on the Plant Research Station, Palmerston North.

Germination counts were made when the plants were about 4 in. above ground, and the percentage of smutted plants observed when mature. The figures given in the accompanying table of results represent the mean percentage from sowings on three plots, 1,200 seeds.

No measurable differences in vigour could be detected at any stage between the plants from the dusted and those from the undusted seed. Weather conditions were most unfavourable during the spring sowings, and the germination figures are in consequence abnormally low.

Mean Results of Sowings at Weekly Intervals on Three Plots at the Plant Research Station, Palmerston North, 1935.

Date Sown.	Wheat.						Barley.						Oats.								
	Check.		Agrosan G.		Ceresan.		Check.		Agrosan G.		Ceresan.		Check.			Agrosan G.			Ceresan.		
	Germ.	Smut.	Germ.	Smut.	Germ.	Smut.	Germ.	Smut.	Germ.	Smut.	Germ.	Smut.	Germ.	Smut.	Stripe.	Germ.	Smut.	Stripe.	Germ.	Smut.	Stripe.
May 9 ..	77	10·9	77	..	72	..	72	0·53	70	..	72	..	85	0·8	14	83	0·1	3·3	85	..	..
,, 16 ..	67	7·7	84	..	71	..	81	0·43	86	..	85	..	77	0·3	7	92	..	0·3	96	..	..
,, 25 ..	61	15·4	75	0·1	69	..	76	0·3	82	..	80	..	82	0·9	13	86	0·3	2·7	87	..	..
,, 30 ..	77	9·8	79	..	85	..	80	0·2	84	..	85	..	86	1·2	9	90	0·8	1·4	89	..	..
June 7 ..	62	5·1	70	..	75	..	70	0·3	76	..	77	..	79	0·4	14	91	0·1	2·9	93	..	..
,, 13 ..	73	2·7	72	..	75	..	69	..	79	..	78	..	84	0·6	9	89	..	2·7	89	..	..
,, 20 ..	61	10·2	63	0·2	56	..	63	..	66	..	58	..	69	0·1	9	85	..	0·9	82	..	..
,, 27 ..	51	4·3	61	..	57	..	62	0·1	67	..	66	..	69	0·5	9	80	..	0·7	81	..	..
July 4 ..	61	10·4	68	0·1	66	0·1	59	0·27	60	..	58	..	65	0·6	9	71	..	2·7	72	..	0·1
,, 11 ..	52	13·3	62	..	62	..	53	..	56	..	58	..	63	0·3	10	65	0·3	2·7	63	..	..
,, 17 ..	56	8·4	64	0·2	66	..	57	0·1	56	..	58	..	69	0·1	15	73	..	3·3	70	..	0·1
,, 25 ..	39	8·3	47	0·5	47	0·1	33	..	36	..	40	..	47	1·1	13	51	..	3·3	56	..	..
Aug. 1 ..	41	4·4	47	0·3	49	0·2	45	0·7	46	..	55	..	64	1·0	8	71	0·1	1·3	67	..	..
,, 8 ..	29	1·9	37	..	35	0·4	28	0·37	28	..	28	..	35	0·7	7	38	0·1	1·0	42	..	..
,, 15 ..	20	3·5	30	..	32	..	31	0·33	37	..	35	..	43	0·1	5	53	..	0·8	50	..	..
,, 22 ..	17	8·0	34	..	28	..	34	0·6	32	..	36	..	41	0·8	8	46	0·4	1·3	37	..	..
,, 29 ..	46	3·1	46	..	52	..	31	0·6	45	..	49	..	62	0·8	7	65	..	2·0	71	..	..
Sept. 5 ..	40	0·3	48	..	50	..	47	1·33	51	..	45	..	65	1·4	8	76	0·4	1·3	73	..	..
,, 11 ..	28	0·7	41	..	47	..	45	0·50	50	..	49	..	68	1·7	7	74	0·1	1·3	76	..	..
,, 19 ..	23	..	28	..	23	..	21	..	24	..	22	..	50	1·3	10	49	0·3	2·3	56	..	..
Mean ..	49·1	6·4	56·6	0·06	55·8	0·04	52·8	0·33	56·5	..	56·7	..	65·1	0·7	9·5	71·4	0·15	1·9	71·7	..	0·01

SUMMARY OF RESULTS.

Taking a general mean of twenty weekly sowings, each of three plots, dusting wheat-seed with Agrosan G at 2 oz. per bushel increased plant establishment over that of the untreated seed by 15 per cent., barley-seed by 7 per cent., and oat-seed by 9·5 per cent. The corresponding figures for Ceresan (U.T. 1875) were 13·6 per cent. with wheat, 7·4 per cent. with barley, and 10 per cent. with oats. With wheat and barley the increased establishment following dusting was about three times greater in the lower ten mean germinations than in the upper ten, but with the oats the differences were about 10 per cent. greater in the upper ten means than in the lower.

Stinking-smut of wheat was reduced from 6·4 per cent. in the untreated seed to 0·06 per cent. with Agrosan G and to 0·04 per cent. with Ceresan (U.T. 1875). With barley the untreated seed produced 0·33 per cent. of covered-smut and the Agrosan G and Ceresan dusted seed none. An incidence of 0·7 per cent. of smutted oat-plants with the untreated seed was reduced to one of 0·15 per cent. by Agrosan G, and to none by Ceresan.

Oat-seedlings showing symptoms of stripe disease were reduced from 9·5 per cent. to 1·9 per cent. by Agrosan G and to 0·01 per cent. by Ceresan.

DRY MASH *versus* WET MASH.

FOR FEEDING OF CHICKS IN BROODER.

W. L. JOURDAIN, Poultry Station, Department of Agriculture, Wallaceville.

DURING the months of September and October of the 1935 breeding-season an experiment was carried out at this Station for the purpose of ascertaining the relative merits of wet-mash and dry-mash feeding for growing chicks. The chicks which took part in this experiment were from a batch of sexed pullets, there being 102 pullets in each pen.

The brooder used was a Beck's electric brooder, which was divided equally into two pens by a partition. This enabled both lots of chicks to be reared under exactly the same conditions.

Pen No. 1 was fed with the ordinary wet-mash ration, which is that fed to all chicks reared at this Station. Pen No. 2 was fed with a dry-mash mixture, which was before the chicks all the time.

The experiment commenced on the 2nd September and ran for six weeks, finishing on the 14th October.

The chicks in both pens were weighed before being put under the brooder and were thereafter weighed on the seventh, fourteenth, twenty-first, twenty-eighth, and forty-second days. Table II gives the results of the weighings.

Pen No. 1 (Wet Mash).—These chicks were fed a grain-mixture of three parts finely cracked wheat and one part maize for the first week. They received four meals per day at the commencement until they were all eating, when the meals were reduced to three a day, which were fed at the hours of 7.30 a.m., 11.30 a.m., and 4.30 p.m. The amount of grain intended for each meal was first soaked with skim-milk for about an hour to allow it to swell.

From the eighth day the chicks were given two mash-meals and one grain-meal per day, the mash-meals being fed at 7.30 a.m. and 11.30 a.m., and the grain-meal at 4.30 p.m.

The mash-meals consisted of equal quantities of bran and wheat-meal, the amount of bran being slightly less than usual. It was found that the chicks were leaving a little, thus necessitating the reducing of the proportion of bran in the mixture until there was no wastage. This mixture was then fed right through the test, except that 3 per cent. of meat-meal was added after the fourteenth day. The meals given to Pen No. 1 were mixed with skim-milk, and water was given them to drink. Included in the feeds for the first four days was approximately 1 per cent. of fine oyster-shell grit, and from the fourth day onwards this oyster-shell grit was always before them in an open hopper allowing them to consume as much as they required.

After the fourth day the chicks were given young green oats and silver beet, finely cut up, and this green food was fed separately between the meal hours at 9 a.m., 2 p.m., and, after the last meal, at 5 p.m.

Pen No. 2 (Dry Mash).—The chicks in this pen were fed with a mixture of dry mash (see Table I) throughout the test, and they were given skim-milk to drink from the start. With the exception of these two differences they had exactly the same treatment as the chicks in Pen No. 1. They were fed a little scratch grain (see Table I) at 5 p.m. to encourage them to work; but it was noticed that they never at any time appeared ravenous for it.

The mash and grain mixtures for Pen No. 2 were made up as follows:—

Table I.

Mash.	Grain.
40 lb. ground maize (maize-meal).	75 lb. (three parts wheat).
20 lb. bran.	25 lb. (one part maize).
14 lb. pollard.	
10 lb. ground oats (not oat-meal).	100 lb.
84 lb.	

Observations.

During the test it was noticed that although the chicks in Pen No. 2 (dry mash) had good colour in their legs it was never at any time as deep a yellow as the colour in the legs of the chicks in Pen No. 1 (wet mash). As far as could be seen, there was little, if any, difference between the two pens in respect to feathering.

As will be seen from the accompanying table of weights (Table II), there was practically no difference between the aggregate weights of the chicks in the two pens right throughout the test. Up till the fourth week the chicks in each pen were individually fairly even in size, but from then on there was a decided difference. While the chicks in Pen No. 1 continued to grow steadily and evenly, the chicks in Pen No. 2 began to grow unevenly, for while some of them grew exceptionally quickly, growing bigger than the chicks in Pen No. 1, the remainder seemed to be at a standstill.

There was a big difference in the amounts of liquid consumed in the pens. The chicks in Pen No. 2 drank almost twice as much as those in Pen No. 1. This difference would be, to some extent, owing to

Pen No. 2 having the dry mash and also to the fact of its having skim-milk to drink, while Pen No. 1 had water and the mash already being moistened would necessitate less to drink.

The following tables give details of weights of chicks and the classes, amounts, and cost of foods used for each pen during the experiment :—

Table II.—Weights of Chicks.

Number of Chickens.	Age.	Weight.	Average Weight.
TEST I: PEN NO. 1 (WET MASH).			
	Days.	lb. oz.	oz.
102	1	8 8	1·33
99	14	20 4½	3·27
99	21	31 0¼	5·01
96	28	44 14¾	7·49
95	42	76 10	12·91
TEST I: PEN NO. 2 (DRY MASH).			
102	1	8 8	1·33
98	14	20 13	3·39
98	21	30 10¾	5·01
96	28	44 10¾	7·44
96	42	76 3	12·66

Table III.—Class, Amount, and Cost of Food consumed.

PEN NO. 1.

Foodstuff.	Price.	Amount consumed.	Cost.
		lb. oz.	s. d.
Wheat-meal	10s. per 100 lb.	80 0	8 0
Bran	7s. per 100 lb.	33 8	2 4·14
Meat-meal	8s. per hundredweight	3 14	0 3·321
Wheat	5s. 7d. per bushel (60 lb.)	68 4	6 4·212
Maize	5s. per bushel (50 lb.)	22 12	2 3·3
Hulled oats	5s. 9d. per bushel (40 lb.)	2 8	0 4·312
	Total cost for six weeks		19 7·285

Average cost per chick approximately = 2·401d.

PEN NO. 2.

Foodstuff.	Price.	Amount consumed.	Cost.
		lb. oz.	£ s. d.
Ground maize	9s. per 100 lb.	107 0	0 9 7·56
Bran	7s. per 100 lb.	48 8	0 3 4·74
Pollard	6s. 6d. per 100 lb.	36 8	0 2 4·47
Ground oats	15s. per 100 lb.	24 4	0 3 7·65
Meat-meal	8s. per hundredweight	5 12	0 0 4·928
Wheat	5s. 7d. per bushel (60 lb.)	18 8	0 1 8·658
Maize	5s. per bushel (50 lb.)	6 0	0 0 7·2
	Total cost for six weeks		1 1 9·206

Average cost per chick approximately = 2·665d.

NOTE.—The average number of chicks in each pen was ninety-eight for the whole period of the experiment.

Influence of Feeding on Minerals in Blood and Bones.

When the chickens were four weeks old, and again when fourteen weeks old, two birds from each pen were delivered to the Veterinary Laboratory for analysis. Table IV contains the resultant data supplied in the report of Dr. Hopkirk, Officer in Charge of the Veterinary Laboratory.

Table IV.

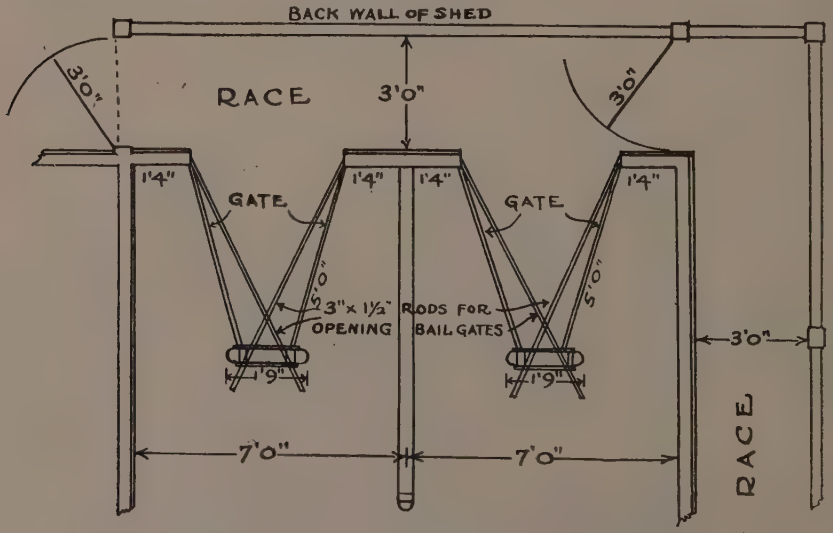
—	Blood (Calcium).	Blood (Inorganic Phosphorus)	Bone Ash.
			Per Cent.
30th September—			
Wet mash (average of two birds) ..	9·2	6·7	46·5
Dry mash (average of two birds) ..	10·0	5·5	43·9
12th December—			
Wet mash (average of two birds) ..	11·6	4·7	47·3
Dry mash (average of two birds) ..	11·6	5·8	47·3

The values for blood calcium and inorganic phosphorus are given in milligrams per 100 c.c.

No significant differences exist between the groups and all values lie within normal limits for birds of that age.

A MODIFICATION OF THE WALK-THROUGH MILKING-SHED.

The modification of the walk-through milking-shed which is described herein developed in two stages, the first having been used in the Waikato about the year 1930. It consisted of hinged sides on the "dummy" and an opening at the back of the "dummy" through which both cows passed out on to the exit race.



A MODIFICATION OF THE WALK-THROUGH MILKING-SHED.

[illegible] of this type were very rich and thought [illegible] the spring and winter months, and the [illegible] with the ordinary cow could not be [illegible] Dairy Bureau where it is now very popular.

The stall cleaner has a number of advantages. It has been [illegible] in use at the end of the cow. The stall being [illegible] from the cow's [illegible] which is apt to [illegible] with [illegible] bedding. The cleaner is [illegible] when the cow is [illegible] There are no [illegible] with the cow.

Plans of this plant which can be used as a modification of the [illegible] plan provided by the Department are obtainable on application to the Secretary, Dairy Bureau, Department of Agriculture, Private Bag, Wellington, or from officers of the Bureau.

—*Dairy Bureau.*

DAIRY FACTORIES (LICENSING) REGULATIONS, 1936.

By the above-named regulations the Dairy Factories Licensing Regulations, 1931, are revoked and new regulations substituted. Except as mentioned below the new regulations incorporate the provisions of the regulations which have been revoked.

The principal changes made by the new regulations governing the licensing of dairy factories have been specified hereunder, or referred to as follows:—

1. To include within the scope of the licensing provisions premises on which cream is received after the hours of the ordinary milk operations of the dairy factory, as defined or extended so as to include the manufacturing capacity of the premises.

2. To provide that portion of the cost of any investigation made by a committee in respect of an application for a licence referred to it for that purpose shall, in cases in the applicant who shall be required to lodge security for the payment of such costs. An applicant for a licence is required to meet the costs of the investigation only exceeding five of the report of the committee is unfavourable or if the committee recommends the grant of a licence to an owner and substantially greater than the extent to which the factory of the Dairy Bureau may have previously maintained, to the applicant that he was prepared to grant a licence. A certificate of the Director as to the costs of any investigation shall be final and conclusive as to all matters and any dispute as to whether the recommendation of a committee is that the applicant should be granted or to an owner substantially greater than any recommendation previously given by the Director, authority may be given to grant to the applicant a licence in part only shall be referred to the Director. Provision of appeal where decision shall be final and conclusive in all respects.

3. To include power to insert in a licence conditions limiting the quantity and kind of dairy produce that may be manufactured in dairy factories, and limiting the purpose for which the premises may be used.

4. To provide that any licence issued prior to the commencement of these regulations shall be deemed to be the same purposes and to be valid.

5. To provide for the revocation of licences [illegible] of the Director, as set out in clause 11.

6. To provide that alterations or extensions of plant and buildings in respect of licensed premises shall be made only with the prior approval of the Director of the Dairy Bureau, who may, in a proper case, refer any application for approval to a committee for investigation. All the provisions of the regulations relating to applications for licences, powers of investigation by a committee, and appeals in cases of any investigation apply to any such application as if the application were an application for a licence.

7. To authorise the payment of a fee not exceeding £2 2s. per day to members of a committee for their services, together with all reasonable and actual expenses incurred by them as necessary and incidental to an application referred to the committee for that purpose.

—*A. E. Morrison.*

SEED-WHEAT CERTIFICATION.

CERTIFIED CROPS.

UNDER the Government scheme for the certification of seed wheat the following growers have seed for sale from crops which have passed both field and grain inspections. (A previous list, to which purchasers are also referred, was published in the March *Journal*.)

Variety.	Grower.	Acreage.
Cross 7	*R. and P. Campbell, Kingsdown, Timaru ..	30
	C. A. Campion, Mount Hutt R.D., Methven ..	5
	*M. P. Daniel, Kingsdown, Timaru	9
	G. Farquhar, Mount Hutt R.D., Rakaia ..	18
	*A. Jackson, Otipua, Timaru	17
	*Mrs. L. E. Johnston, Rosewill, Timaru ..	16
	*W. C. Lowery, Winchmore R.D., Methven ..	26
	J. R. McCulloch, Ngapara, Oamaru	8
	*W. W. Mulholland, R.M.D., Darfield ..	20
	A. H. Roberts, Pleasant Point	16
	*F. W. Ruddenklau, Winchmore R.D., Methven	12
	*J. G. A. Ruddenklau, Winchmore R.D., Methven	12
	A. B. Timblick, Hilton R.D., Temuka ..	23
	*R. J. S. Watson, Mount Hutt R.D., Rakaia ..	5
Dreadnought ..	R. Dick, Weston, Oamaru	25
	A. Smith and Son., Duntroon, North Otago ..	8
Hunter's II ..	*R. H. Johnston, Dunsandel	8
	*J. H. Marshall, Levels Valley	10
	R. J. Murphy, Pleasant Point	15
	A. Smith and Son, Duntroon, North Otago ..	14
Solid Straw Tuscan ..	*W. Adams, Dunsandel	13
	*R. I. Black, Waikari	17
	R. H. Johnston, Dunsandel	48
	J. H. Marshall, Levels Valley	17
	*Pleasant Point High School, Pleasant Point ..	18
	F. and R. Talbot, Woodlands, Temuka ..	11

* Passed subject to machine-dressing of seed.

—*Fields Division.*

DEPARTMENT OF AGRICULTURE.
WALLACEVILLE POULTRY STATION.

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Veterinary Laboratory,
Private Bag to Wallaceville,
WELLINGTON.

SEASONAL NOTES.

THE FARM.

Pre-winter Top-dressing.

In many districts the abnormal rainfall of the expired portion of the current calendar year has given, at this season, a feed position very different from that obtaining widely at the corresponding period last year, when stock had just come through a period of markedly low rainfall and of scant supplies of feed. Just how farm practice should be adapted to the present position is a question which needs to be solved for each particular set of conditions and about which no specific guidance generally applicable can be given with any great safety. In some instances feed is so abundant and growth of pastures continues so vigorously that the benefit to be obtained from pre-winter top-dressing is not so apparent as it normally is. On the other hand, farms on which pre-winter top-dressing well may be expected to prove profitable are far from uncommon; included in some of these farms are ones on which stock have been carried in sufficient numbers to make effective direct use of all the feed that has become available and others on which the reserves of feed for use in late winter and early spring are not as great as it would be advantageous to have them.

In regard to those farms on which pre-winter top-dressing is advisable, it should be kept in mind that the period during which the fullest benefit is obtainable from such top-dressing is drawing to a close, and especially in the colder districts any considerable delay in carrying it out should be avoided as far as possible. If top-dressing is not carried out until close to the season when the growth of grass is at its lowest point, then the top-dressing approximates in its effect to spring top-dressing, and some of the value of pre-winter top-dressing is lost: much of this value lies in the fact that quickly acting phosphates applied in April or May usually bring about an almost immediate increase in the rate of grass-growth, an increase which commonly is of value in carrying stock along in good condition until adequate spring feed becomes available. For pre-winter top-dressing it is advisable to select pastures which are relatively well drained, well sheltered, and rich in rye-grass. Such fields are better fitted to respond satisfactorily to stimulation during the cold season. Especially in sheep-farming, pre-winter top-dressing is at times particularly desirable, because the dressing of broken or rolling country tends to be more difficult and costly after winter rains have made the land soft.

The current position may be summed up by saying that the cases in which the abnormal season has made pre-winter top-dressing inadvisable when it would be advisable in a normal season are relatively few, and certainly fewer than at first thought they might seem to be, particularly if the current wide-spread abundance of feed is allowed to impress one unduly. The crux of the position lies in the well-established fact that usually the supplies of feed for winter and early spring are greatly below the economic needs of our live-stock, and a combination of favourable seasonal conditions and judicious top-dressing such as is normally advisable may be expected merely to raise the feed supply nearer than it generally is to the level fixed by the amount of feed that the stock can utilize profitably.

Liming of Grassland.

In localities in which beneficial results are obtained from liming of grass-land, success has attended the application of the lime in April and May. Whether better results are obtainable from applying the lime at any other season is a question about which little or no recorded conclusive experience

is available. Probably in the first place liming in April and May was practised because of its convenience due to the fact that commonly there is no marked pressure of work at this season, and, having proved satisfactory, has been continued. A limited amount of investigation throwing some light on this matter which has been carried out suggests, though it does not definitely establish, that liming at other seasons will not prove more effective than liming about April or May.

In regard to an extensive series of field trials which have been carried out throughout the Dominion during recent years, the 1935 annual report of the Department of Agriculture states :—

"The survey of the response of New Zealand grassland to various classes of fertilizers and to lime is a task of major importance which has already provided practical guidance of considerable moment. For instance, it throws useful light, possibly unexpected by many, on the variations in the response of grassland to lime from district to district. It would seem that some farmers err by spending money on lime and others by not spending enough money on lime."

In the same report, relative to the record amounts of lime carried by rail during the previous year, it is stated :—

"If it were certain that the lime-supplies were being used where farm experience and investigation have shown that they are productive of profitable results, then the recent increases in the amount of lime handled would be a matter for congratulation, but when the railage destinations of certain substantial supplies are checked against the results of field trials and veterinary experience it seems that lime is at times being used increasingly without any evidence that would justify recommending its use. From the available evidence it seems probable that some districts with advantage could use greater quantities of lime than are being used, while in other districts the outlay now made on lime could be made more profitably in other directions—*e.g.*, in the use of phosphates."

Further interesting information about the use of lime is contained in articles by M. C. Franklin and J. W. Woodcock in this *Journal*, November, 1935, and January, 1936, respectively. These articles taken together indicate that some of the views about lime most deeply rooted and most widely accepted are to be viewed as belief rather than as knowledge, and they support the statements quoted above in making clear the advisability of obtaining authoritative information about the benefits obtainable from liming before embarking on any considerable outlay on lime for use on grassland, particularly if such an outlay is to result in a reduced outlay in phosphates.

Approximately 2 tons of ground limestone are equivalent in their ultimate influence on the soil to 1 ton of burnt lime (100 lb. of ground limestone is equivalent to 56 lb. of burnt lime when both are pure). As a general rule, considering only the effect on the soil, it is not of material importance whether ground limestone or burnt lime is used provided the dressings of ground limestone are about twice as heavy as those of burnt limestone. Hence their relative costs should determine which of the forms of lime should be used. Certain special circumstances may justify departure from this rule. For instance, if speedy action is desired, as in the removing of soil-sourness for the better control of crop-disease such as club-root, then burnt lime should be used. Again, the cost of transport and handling as distinct from the cost of the material, if relatively heavy, may make burnt lime preferable. Indeed, especially when the land is not particularly in need of lime, the costs of handling and transport are at times so heavy as to make expenditure on liming either not worth while or not so profitable as expenditure on other top-dressing material such as phosphates.

Ordinarily, supplies of lime in the soil tend to be depleted because the lime is washed down and leached away. Hence the working of lime into the soil is to be avoided usually, as it is simply a means of hastening loss. The present practice in liming tends towards relatively small dressings, say, 3 cwt. to 5 cwt. an acre, repeated at comparatively short intervals

instead of the heavy dressings at long intervals which were more common in years past; it is to be noted, however, that in Otago and Southland comparatively heavy dressings of 15 cwt. to 25 cwt. an acre are still most popular.

It is exceptional for lime alone to give good results, and generally the best returns from liming are obtainable from the use of lime and superphosphate together. Indeed, a poor result from superphosphate alone is an indication of a probable profitable response from lime used in conjunction with superphosphate.

To sum up two important features of current liming practice, (1) there is failure to use lime adequately on a substantial number of farms which would respond profitably to free use of lime; (2) there is replacement of phosphates partly or wholly by lime on farms about which there is no evidence that liming is economically sound. Farmers who have not definite knowledge of the effect of lime in their district may obtain all available facts from local officers of the Fields Division.

Harrowing of Pastures.

Knowledge of the undoubted value of harrowing at this season pastures on which animal droppings have accumulated is widespread. Nevertheless, frequently such harrowing is not carried out. This is due at times to the fact that the extent of the difference between harrowed and unharrowed pastures otherwise similarly treated is far from fully realized; undistributed droppings mean subsequent development of rank patches of growth with which is associated probability of pasture-deterioration, whereas when the droppings are distributed thoroughly and without overmuch delay the development of rank growth is obviated and the pasture as a whole is improved. A more fitting appreciation of the value of grass-harrowing would obtain if those concerned kept in mind the established value of farmyard manure in European and American farming, wherein there is costly and careful provision to bring about its most effective use. On the other hand, in our farming storage of the animal manure is unnecessary, and much but not all of the necessary distribution is brought about naturally. Yet many neglect the small but relatively inexpensive attention —harrowing—which is needed here to turn abuse of the animal manure into its profitable use. The farmer who omits to do harrowing before the winter is practically sure to be faced with the task of dealing with uneven pastures in the spring—the effective grazing of such uneven pastures can seldom be carried out without "punishing" the stock in order to force them to graze the rank unattractive pastures.

Treatment of Young Pastures.

Special care in the treatment of young pastures proves profitable. The plants, having been given a fitting opportunity to establish themselves, should neither be allowed to become tall and productive of flower-heads nor be continuously eaten down closely: the latter generally is the less likely this season because of the abnormally abundant growth of feed during the summer and autumn. To keep the plants desirably short it usually is preferable to graze young pastures by a relatively large number of stock for a short time only. This avoids the relative hard grazing of the more attractive species and the neglect of other species which are apt to occur under protracted light stocking. Persistent close grazing of young pastures is especially harmful because it checks or maybe prevents the development of strong root systems, upon which the future vigour of the pasture depends. Properly controlled grazing, which not only avoids persistent close grazing but also prevents too rank a growth during the early life of the pasture, leads to stooling-out of the plants and consequently to a denser sward that more completely covers the soil. As far as is practicable, grazing of young

pastures should be avoided if the ground is soft, as it is apt to become because of rain: trampling of wet, soft ground readily leads to bare patches of soil on which weeds may become established eventually. Particularly in the case of young pastures is additional fertility due to top-dressing likely to be valuable, because during a critical stage it helps better plants needing higher fertility to struggle successfully against competing poorer species.

Provision of Feed Reserves.

It becomes advisable at this period to draw up a programme of the coming year's provision of special feed. It is quite possible that later some modification of this programme will become necessary, but radical modifications are not likely to be needed, and in the interval the programme is of value as the basis of decisions about various matters, such as the location of fences and silos and cultivation work, which should be planned now so that labour may be devoted to them from now onwards as opportunity offers.

In drafting a programme of feed-provision it is important not to depend too much on what can be provided next season by means of silage and hay from pastures unless there already exist sufficient reserves of feed to tide over the normal critical periods, even should an unfavourable season lead to but scant surplus pasture-growth for conversion into silage or hay. Ensilage is an excellent means of placing surplus grass-growth in reserve, but in many districts to count definitely on an adequate surplus being available is such a risky practice that arable cropping to give assurance of the year's provision of feed should be carried out.

In many localities, especially where the growth of grass during winter is practically negligible, autumn cultivation is valuable as a preparation for such crops as mangels, carrots, potatoes, and lucerne, and at this stage no suitable opportunity should be missed of cultivating land in May for spring sowing. Early ploughing (possibly skim-ploughing) of land for crops to be grown after grass gives sufficient time for the complete breaking-up and mixing of the sod with the remainder of the soil. This begets increased fertility, which, while generally useful, is specially valuable for potatoes and mangels. Because of the value of timely preparatory cultivation of this type, it is fortunate that lea land can at times be worked safely when adjoining similar land which recently has been under the plough is too wet.

Autumn Utilization of Crops.

Immature living organisms as a rule are tender, delicate, and less able without injury to undergo hardships to which as adults they could be subjected without permanent harm. For farm-stock winter often is a time of hardship, and calves and hoggets, because of their immaturity, are likely to receive permanent setbacks unless they receive good attention. Setbacks sometimes originate in abrupt substantial changes in feed. Such changes may be obviated by familiarizing young animals with hay, and especially with silage, when they are still in good condition and still have available other feed. Training stock to eat strange fodders before they are called upon to subsist on them wholly is generally advisable.

Hoggets, which should be given the best treatment possible, well may be given the run of any available fodder crop before they become low in condition, and, if it is possible, they should be given a run-off on a suitable pasture—one which is clean, short, and fresh, and so unlikely to be contaminated with parasites.

In the case of dairy cows much more could be done than is done usually in the way of feeding liberally during the off-season—a procedure which may be expected to react beneficially on production during the subsequent season. During the season of low production the good cow naturally and necessarily builds up bodily reserves which stand her in good stead under

the drain and strain of a season of high production. She can, however, build up these reserves only if she consumes the nutriment which is needed in the creation of reserves. In practice this means that she should be well fed when she is not actually producing, just as when she is producing heavily, although, of course, the standard of feeding when she is not producing does not need to be quite as high either in quantity or quality as during heavy production. The point of practical importance, however, is that the standard of feeding advisable during the off-season profitably could be made appreciably higher than it commonly is. Frequently it has been noted of cows outstanding as producers that they displayed ability to " milk off " bodily conditions, and their high production has been linked causally with this ability. The point of practical importance is that the ability is of no avail unless in the first place the cows are fed in such a way that they are enabled to develop the condition which subsequently affects production beneficially. In short, producing-ability without good feeding during the period of low production does not take us far enough.

The trampling and firming of lucerne-fields which certainly result from grazing during autumn and winter should be avoided if at all possible, and this year especially, because of the exceptionally abundant growth of grassland, it should be possible to reduce the grazing of lucerne to a minimum, if not to dispense with it completely. Thriving lucerne is such a valuable crop that all avoidable causes of its deterioration should be eliminated as far as is practicable: autumn and winter grazing of lucerne generally is a definite cause of deterioration.

—R. P. Connell, Fields Division, Palmerston North.

THE ORCHARD.

Late Harvesting.

In most commercial orchards the fruit that now remains to be harvested is the final picking of the late-maturing export varieties and the fruit which has been left to tree-ripen. Sturmer Pippins which are left to tree-ripen should be harvested before " apple-spot " develops.

Fruit held in ordinary shed storage should be sorted at intervals, and any fruit developing rots removed. Any fruit showing signs of depreciating should be marketed without delay. With care, most of the late varieties will hold satisfactorily for a considerable time in ordinary shed storage, provided the fruit has been carefully handled and graded to eliminate fruit with disease and skin punctures. Fruit held in cool store should be examined frequently, and any lines showing forward maturity marketed before condition is lost.

Late Spraying.

Following the completion of the harvesting it is advisable to spray stone-fruit at " leaf fall " with Bordeaux 5–4–50. From results observed over the past few years it is recommended that all varieties of both apples and pears likewise receive a similar spray at " leaf fall." The practice of using Bordeaux in the autumn in place of at the " green tip " period has been found in normal seasons to minimize russet greatly. If an autumn Bordeaux spray is applied it should be followed by a strong lime-sulphur spray (1 pint by volume to 15 parts water) in the spring at the " delayed dormant " period, excepting on varieties which have been badly affected with black-spot the previous season, and these varieties should receive a further Bordeaux spray at the " delayed dormant " period.

Following the autumn spray, the spraying outfit should be thoroughly cleaned, overhauled, and renewals made where necessary. The pipe-lines of stationary plants should be well flushed out. The work of overhauling the outfit is best done during the winter, when there is usually time to spare before the new spraying season commences.

Ploughing and Manuring.

Deep ploughing of the orchard at least once a year is advisable, but it should not be so deep as to cut or seriously damage the main roots. It is recommended that this ploughing be done in the late autumn, as the effect of the injury upon the tree is less should the feeding-roots be disturbed at this time of the year than when the tree is in growth.

It is also preferable in most cases to turn under cover crops which are sufficiently mature in the autumn, so that the green matter may decay before the spring cultivation commences.

Applications of phosphatic and potassic manures may be made during the autumn just prior to the ploughing of the land. Soils requiring lime may be top-dressed with approximately 1 ton of carbonate of lime per acre. The application of the quickly acting nitrogenous fertilizers should be delayed until the spring.

New Plantings.

In selecting a site for the young orchard due consideration should be given to securing good, warm land favourably situated as to aspect to sun, natural drainage, and provision of shelter.

The area intended to be set out with new plantings should be thoroughly tilled and put in fine condition. If the order for trees has not already been given no further time should be lost in placing it.

On well-drained situations in the warmer areas, the planting of trees may be commenced at the end of autumn; otherwise it should be carried out in the spring, when the land is in suitable condition. At planting the trees should receive up to ½ lb. of a phosphatic manure, to be followed in the spring with a dressing of up to ¼ lb. of nitrogenous fertilizer.

The provision of adequate shelter is of paramount importance, and it is advisable to establish shelter preferably two years in advance of setting out new plantings, so that the young plantation will not be thrashed by prevailing winds. Adequate room should be left between the shelter-belt and adjacent row of fruit-trees so that when fully grown the shelter does not overcrowd the first row.

General Work.

Before the winter rains commence all open drains should be cleaned out and the exits of covered drains opened up. Provision for new drains should be made wherever necessary. Adequate drainage is most important for the health of the trees, which cannot thrive or crop to perfection on wet, retentive soils. Each year many trees are lost through lack of sufficient attention to this aspect of orchard-management.

At the end of the harvesting and packing season the packing-shed should be cleaned up, the mechanical grader cleaned and greased, any spare packing material safely stored until the next season, and any waste and diseased fruit should be gathered and destroyed. Orchard boxes should be collected, repaired, and stacked under cover till again required. The life of the tree-props will be lengthened if they are gathered now and stored away.

—R. G. Hamilton, Orchard Instructor, Hamilton.

Citrus Culture.

Where new plantings of citrus trees are contemplated every consideration should be given to those factors which are important for successful establishment of the trees. It is essential that adequate shelter should be planted some time, preferably two years, beforehand, as young fruit-trees will not thrive when exposed to cold or strong winds. Where proper care is lacking during the first two or three years they will not grow into satisfactory trees. It is advisable to defer planting until the shelter has become well established.

In selecting an orchard-site only good, well-drained land with a northern aspect should be utilized. If the land is not naturally drained a system of artificial drainage should be undertaken, as citrus trees make poor progress where the soil is at all inclined to become water-logged during wet weather.

The land should be ploughed and subsoiled as early as possible prior to planting, giving a dressing of 2 tons of carbonate of lime per acre, and a cover crop sown which when it decomposes will improve the fertility and mechanical condition of the soil. If it is desired to plant out in the following spring, strips of land where the rows of trees will be planted may be left unsown.

The selection of the trees should not be overlooked. The order should be placed with the nurseryman some months before the plants are required, so as to have the order filled from the best trees available. Trees that are stunted or of indifferent quality should be rejected as they will not make satisfactory trees.

Planting may be undertaken either in the autumn or the spring, but it is only advisable to plant in the autumn in warm situations which are reasonably free from frost.

In older groves the preparation of the soil for the winter should consist of shallow ploughing so as not to cut too many of the surface roots to the detriment of the growing tree, or, as an alternative, a light disking is of value.

—L. Paynter, Orchard Instructor, Auckland.

POULTRY-KEEPING.

The Care of Pullets.

As pullets must be depended upon to supply the great bulk of the eggs during the next few months every care should be exercised to see that they are made as comfortable and contented as possible. Nothing should be done, or left undone, that is likely to upset the laying pullets, especially at this time. It is well to remember that it is not the natural time of the year for pullets to be laying, and very little will cause them to stop producing and go into what is known as a "false" moult. Only by careful handling, good housing, good feeding, and close and regular attention to every detail can the poultry-keeper expect to secure the very best returns from his pullets during the season when eggs are scarce.

Housing.

In the past thirty years many changes have taken place as to the housing of poultry, and while the successful poultryman has proved by experience the great importance of proper housing there are still many who have the idea that all that is necessary for the birds is a shelter at night in order to protect them from bad weather. While it is a mistake to coddle poultry, the house should be looked upon as their home and playground; especially is this so where pullets are kept on the intensive or semi-intensive system.

The three essentials to good housing are plenty of room, fresh air, and dryness. The first thing to avoid is overcrowding, and each bird should be allowed at least from 8 in. to 9 in. perch room, the perches being at least 18 in. apart, and also a minimum of 4 square feet of floor space. In fact, many of the most successful intensive poultry-keepers have found that better net returns are obtained when 5 square feet are allowed each bird. If more pullets are reared than can be suitably accommodated it is a wise policy to go through them carefully and cull out all the unpromising ones, until those left can be allowed at least the floor-space mentioned. Some poultry-keepers fail to appreciate the great advantage of a regular and careful

grading-up and culling of pullets. Even in the very best of flocks there are to be found some pullets that fail to develop and mature as well as the majority, and if such birds are detected and disposed of, and the extra room, care, and feed is given to the better birds, the financial returns are likely to be better, even though fewer birds are kept.

Many plants have been visited where those late-hatched, backward, slow-growing, and poor-feathered pullets are kept just because they are pullets. It cannot be emphasized too strongly that slow growth and poor development are indications of a weakness, and such birds are really a danger on any plant, for not only are they unprofitable but very often they start such troubles as colds, worm-infestation, feather-pulling, or cannibalism in a flock.

Dampness in Poultry-houses.

Good winter egg-production can hardly be expected unless the floors of the houses are dry. Every effort should therefore be made to guard against dampness in the laying-sheds. The floor of the house should be a few inches higher than the surrounding ground, and proper drainage should be provided under the foundation. Concrete floors are recommended, and if properly made they are impervious to water. Again, the house must be properly ventilated, for if insufficient fresh air is supplied dampness may be caused by condensation. Iron-roofed houses should be lined at least over the perches in order to avoid the drops of water which fall from unlined roofs on a frosty morning.

Compelling birds to roost in poorly ventilated houses is one of the chief causes of autumn colds amongst pullets. Seldom, if ever, does one see birds that roost in trees suffering from colds, but it is a common complaint where birds are housed in poorly ventilated quarters.

It is well to bear in mind that the normal temperature of a fowl ranges from 106° to 107·5° F., thus they require plenty of fresh air in order to keep in good health and condition.

Most of the up-to-date poultry-houses are now provided with back ventilation. The amount of such ventilation needed depends upon the general construction of the house and the locality in which it is built. In most places a house 16 ft. deep by 20 ft. long is all the better for at least three back ventilators, which can be placed in the back wall between the top wall-plate and the roof, one about 1 ft. from each corner and one in the middle. The size of each opening should be at least 8 in. long by 3 in. deep, and it is well to cover them with small-mesh wire netting in order to keep out small birds.

The floor of the house should be covered with 3 in. or 4 in. of good, dry straw, in order to give the birds plenty of exercise. It is very difficult to keep the litter dry during the winter months, especially if the houses are overcrowded; but should the litter get damp and start to give off an adour it must be renewed.

As the pullets come on to lay it is a good practice to handle a few each week in order to ascertain their condition. Should they appear to be losing weight it is advisable to slightly increase their food-supply, especially their grain ration.

While a variety of good plain food will tend to keep the pullets in profit, any sudden change, such as from wheat to oats or barley, may cause a number to go into a "false" moult. A sudden change from old- to new-season wheat has been known to cause a whole flock of pullets to stop laying and go into a moult. When one has to start using the new-season wheat it is safer to make the change gradually—that is, by mixing in first one-quarter of the new with the old wheat, then half, and so on, until the full change has been made, say, in a week or ten days' time. As the pullets come into full lay, the amount of animal food may be gradually increased until up to 10 per cent. or even 12 per cent. is being fed during May, June, and July. It can then be gradually reduced until about 7 per cent. is fed during the spring months.

A regular supply of succulent green feed is necessary to keep the stock in the best of condition, but it is just as well not to give too much during the winter months. A good time to give the green feed is after the last feed at night.

Feather-pulling.

Inquiries have been made as to the cause and treatment of pullets pulling one another's feathers. This bad and annoying habit is often started in the spring amongst young stock, but at times birds of all kinds pick and eat their own feathers or those of other birds. Sometimes the habit is limited to only a few birds, but more often whole flocks are affected. Where this depraved habit once becomes well established it is very difficult to check. The trouble is more frequent where birds are kept on the intensive system, and especially if at all overcrowded.

Experience indicates that this is a deficiency trouble and that the habit is often started by a search for something lacking in the food. At times one bird may start the habit by plucking the young feathers from another bird's tail, and if blood is caused to flow other birds often greedily attack and eat the feathers, and even the flesh of the bird. The crowding of birds into small pens where they have nothing better to do often leads to the formation of the habit, or birds in order to get rid of insects will at times pluck their own feathers. As regards treatment, the first thing to do is to try to ascertain the cause and remove it. It is advisable to keep a close watch on the birds, and if one is noticed pulling another's feathers it should at once be separated from the rest. It is well to make sure that the birds and houses are free from insects. If possible give the stock a run out, and if circumstances are such that this cannot be done, encourage the stock to exercise by increasing the amount of litter. See that a regular supply of green feed is given, and increase the amount of animal food, but reduce the amount of fat-forming food. It is also well to add to the mash a teaspoonful of sulphur for each twenty-five birds, and dissolve in the water with which the mash is mixed a teaspoonful of Epsom salts to each twenty-five birds.

—C. J. C. Cussen, Chief Poultry Instructor, Wellington.

THE APIARY.

Removal of Supers.

INCLUDED in the autumn work which must not be neglected is removal of the supers, and this should be undertaken as soon as the extracting-combs are cleaned up by the bees. It is bad management to leave the bees more space than they can occupy. By removing the supers the space in the hive is restricted, and consequently it is much easier to make the bees snug and warm for winter. Where the strength of the colony permits this should be done, as nothing is to be gained by leaving on the supers. However, it may be impossible in the case of strong colonies to confine the bees to the brood-chambers, in which case the supers can be left on the hives until the spring. By that time most of the bees will be in one story, and the supers can then be removed.

A good plan to follow in getting the bees to clean up the combs is to insert a mat, in which a small hole has been cut, between the brood-chamber and the super. The bees, finding the combs partly cut off by the mat, lose little time in removing the surplus honey. At this operation the excluders should be removed from the hives and stored away until such time as they can be cleansed of burr combs. A little care is necessary in dealing with the excluders, so as not to bend the wires. They can be readily cleansed by plunging them into boiling water.

Winter Stores.

The losses attendant upon starvation are no less serious a menace to the beekeeper than disease. While disease is met with from time to time, each autumn brings the problem of wintering the bees, and, while the professional will prepare his colonies so as to guard against serious losses, the average beekeeper is apt to overlook the matters that make for success. There are factors such as shelter, watertight hives, vigorous young queens, &c., which all play a part in the wintering problem; but, above all, a supply of food sufficient to meet the colonies' wants must not be overlooked. The safe wintering of bees is a test of a beekeeper's capabilities, as he is called upon to gauge the amount of stores required to tide his bees over the period between the autumn flow and the appearance of the early nectar-secreting plants. Locality plays an important part, more especially where autumn flows are unknown and fine autumn weather prevails. In these districts the consumption of stores is greater, and a constant watch must be kept on the hives so as to determine the amount of food required to guard against loss, as breeding will be carried on until a later period in the season.

Various estimates have been given as to the amount of food required to winter the cluster, varying from 30 lb. to 40 lb., and experience has proved that, providing a colony is left with this amount, it not only winters well but builds up rapidly in the spring. In any case, it is by far the safest policy to leave an excess of food rather than run the risk of leaving the colony short and with barely enough to tide it over the dormant period. Where the amount of stores is less than 30 lb., the shortage can be made up quickly by the insertion of a few combs of honey. Calculating on the basis that a full comb contains 6 lb. of honey, it is easy to estimate the weight of honey in the hive. If, however, combs of honey are not available, feeding should be undertaken. This latter operation should not be delayed till the cold weather, but commenced early in the autumn.

For supplementing the stores, sugar syrup, fed in the proportion of two of sugar to one of water, is the best substitute for honey. Avoid using inferior qualities of sugar: none but the best white sugar should be fed. In feeding to augment the winter food-supply it is often necessary to give large quantities of syrup, and consequently large feeders must be adopted. The Miller and the division-board feeders are excellent for this purpose. The former enables about 10 lb. to 25 lb. of stores to be fed at one time. It is designed to be placed inside the super or upper story on top of the brood-frames, and has two compartments for syrup, the passage-way for the bees being in the centre through the bottom, directly over the cluster. The division-board feeder is popular, and enables about 5 pints of syrup to be fed. It hangs between the frames, and all that is necessary is to turn back the mat so that the opening in the top is exposed. The main advantage of this feeder is that food can be supplied without exposing the cluster and without the aid of smoke.

Shelter Essential.

As in the spring, a vital necessity at this time of the year is shelter for the hives. Brood-rearing must be encouraged if the bees are to go into winter quarters sufficiently strong to give good results the following season. If a shelter-hedge or fence has not been provided an excellent temporary breakwind can be erected with manuka-scrub. Shelter without too much shade is the life of an apiary, and on no account should large trees be utilized as a means for protecting the hives. The spaces between the trunks are productive of draughts, and the high branches exclude too much of the sunlight. A live hedge 8 ft. to 10 ft. high is the ideal shelter for an apiary.

Foul-brood.

The risk attendant on carrying over diseased bees is too great, as the trouble is more likely to be spread in the autumn and spring by robbing. In cases where weather conditions have prevented successful treatment, or in which disease is detected on making a final examination prior to putting the bees into winter quarters, it is advisable to remove all combs showing the slightest signs of disease. Where disease is detected in a bad form nothing will be gained by holding the colony over for treatment, and by far the safer plan is to destroy it.

—*E. A. Earp, Senior Apiary Instructor, Wellington.*

HORTICULTURE.

The Past Season.

HEAVY rain, accompanied by high winds during the summer season, is a severe test for horticultural crops. Fortunately such tests are rare, but when they do occur they are not soon forgotten. The season just past has been remarkable for more than one in most parts of the Dominion. The seared foliage and broken branches in many plantations in some parts of the country are evidence of the unusual severity of the storms. In spite of these experiences the season generally has been a good one in many gardens, including those where fruit, vegetables, and flowers are grown in commercial quantities. Crops sometimes have suffered, but not seriously, owing to adequate shelter, secure support for crops which require it, and good drainage being provided. The needs of this kind often vary rather widely, depending very much on the lay of the land and its elevation, as well as the reputation of the locality; but it is very noticeable that the more experienced growers take very little risk from damage from such storms: they lose no time in carrying out the necessary improvements in a very thorough manner. Under the circumstances, quite a few crops benefited considerably from the warm showers; such, for instance, as kidney-bean, marrow, and salad crops.

As is to be expected under the circumstances, crops seriously attacked by insect pests were rather rare, as even those insects which flourish under moist conditions suffer considerable loss in stormy wet weather. Virus diseases among tomato crops, which have levied a heavy toll during recent years, were this season present generally in insignificant proportions. The reason probably is that the thrips and other sucking insects which are the principal carriers of these diseases were well controlled and considerably reduced in numbers by the stormy conditions. The most conspicuous disease in that crop this season was "late blight," *Phytophthora infestans*, which is what one would expect under the humid conditions. Needless to say, where Bordeaux was thoroughly applied the loss from this cause usually was not significant.

Much of the land suitable for horticultural crops lies low and is more or less subject to flooding, or it is liable to be scoured by considerable quantities of water from steep country in the vicinity. To temporize with such circumstances frequently means poor crops and too often a total loss, when, on the other hand, adequate drainage would secure a succession of the good crops which such land should carry, and disaster from flooding would generally be very rare. Where it is necessary, a drainage scheme should be well thought out and carried out now in a thorough manner. Tile drains, drains made with a mole-plough or of manuka-scrub, and open drains, are all effective under certain conditions. The first study should be the successful work of the kind which has been done in the locality. Wet land sometimes dries out and sets very hard, and in either of those extreme

conditions it is of little use; but when it is drained such conditions rarely or never occur, and the friable condition so essential for fertility is soon established.

In few parts of the country may horticultural crops be grown without shelter plantations and hedges. These sometimes fail because they are set at intervals that are too wide, and intersecting-hedges would put matters right. Less frequently failure is due to the lines of shelter-trees being too close and too high; the cropping-areas are then overshaded and there is sometimes insufficient air. This is usually one of the mistakes of early settlers, who planted vigorous species of pines for this purpose at short intervals in good land.

The planting-season extends from May to September inclusive, and during that period shelter plantations and hedges may be planted with good prospects of success if the land is well prepared and planting is done when the soil is sufficiently dry to be friable. Here, again, local experience should be carefully studied before coming to a decision with regard to the kinds of trees and shrubs to plant. It is generally best to select plants which, so far as possible, have the desired qualities natural to their habit. These qualities generally are in regard to height and spread; also a good furnishing of foliage to the base. If these can be obtained without the necessity of frequent trimming and topping, much labour is saved. Lombardy poplar interplanted with barberry or privet, &c., is a popular combination of the kind. Ultimate height without topping in this case depends on spacing and the quality of the soil; where it is inclined to run high the next parallel shelter may be lower than otherwise and at a greater distance. Lawson's cypress (*Cupressus Lawsoniana*) also has the qualities of moderate height and spread with a well-furnished base. It has also been interplanted with poplar with good results. Roman cypress (*Cupressus sempervirens stricta*) has similar qualities with even less spread. Other evergreen conifers that are somewhat similar, but have a greater height, are Redwood (*Sequoia sempervirens*), Douglas fir (*Pseudotsuga Douglasii*), *Cryptomeria elegans*, and *Cupressus torulosa* All of these are thickly clothed to the ground, and have a moderate spread. Under poor soil conditions *Pinus muricata* underplanted with *Elaeagnus japonica* is often most satisfactory in forming good close shelter; but where the soil is at all good they are, for this purpose, inclined to ramp. On land fair to good, and especially where exposed to salt winds, species of the native *Coprosma*, *Olearia*, and *Metrosideros* have good appearance, moderate height, are compact, and require little attention to make them effective shelter. Many of them are at their best when growing in exposed positions. These suggestions have in view chiefly a one-line shelter-belt with perhaps a hedge under-planted or interplanted.

Vegetable Crops.

The preparation of the land and the purchase of seeds and other supplies compels an early decision on such subjects as what is to be grown next season and where. Such questions are of the greatest importance in attaining the best results, especially when the cropping is done as a commercial enterprise, for then very often it is a question not only of what crop is likely to be in keen demand, but also at what season it must be produced to find a good market. Those who are accustomed to cater for markets are always impressed by the varied and changing demands, especially in the trade in plants and flowers. A close and sympathetic touch with the market is necessary to forecast correctly the demands of the future, and the success of many is due to not only producing big crops, but also securing good prices, by this means chiefly: production and profitable distribution must always be considered together in commercial cropping of this class. Personal preference must be entirely laid aside, and the market demand must be studied with detachment.

The land and climate also naturally vary from place to place, and each piece of land under cultivation has its limitations, but also its special possibilities and qualities. It may be frost-free or subject to low temperatures; situated in a wet climate or a dry one; consist of light land or heavy; and so on. Each condition has its own special range of opportunities, and successful cropping, particularly when it is for commercial purposes, depends on one taking full advantage of them—not struggling against adverse conditions, but making the most of those conditions which are advantageous. For instance, one situated in a locality with low temperatures has but a poor chance of competing in the early-potato market (unless transport conditions are outstandingly to his advantage) with those growers in frost-free districts. On the other hand, the latter has no chance of competing with growers in the colder and drier districts in the production of main-crop potatoes and potatoes for seed.

Then, again, heavy land recently broken in—drained recently but not having had time to acquire all the advantages of that operation—may be so unsuitable for most kinds of crops that it may have to be sown down in grass and grazed for a number of years before it can with advantage be broken up for annual cropping. Or newly ploughed grassland that is heavy may be insufficiently friable for fine seeds during the first season, and it is one of the reasons why potatoes are so often planted on land of that kind. Not that the land in its present condition is very suitable for that crop, but it is one of the few which makes some little return while the process of improvement of the soil by periodical cultivation is taking place.

On land where horticultural crops have been grown for some time, the economy and advantages of crop rotation are generally well understood; but, as with many good precepts, it is sometimes difficult to practise crop rotation as one would like. For instance, the limitations of profitable market-demand may reduce the crops to such a small variety and number that a suitable rotation is difficult to arrange. Then, one has to break new ground at intervals and sow down and graze the cropped land for a period—an excellent method—or one has to be satisfied with one cash-crop per annum and follow it up with a green crop for ploughing under, a method which has rather a limited application. On the other hand, that portion of the domestic home-garden which is devoted to annual vegetable crops may be so small that a rotation, in the ordinary way, cannot well be arranged; in which case by severely limiting the variety of crops grown each season a total change of crops may be made from year to year—a method which will establish a satisfactory rotation of cropping with all of its advantages, simplify the management, and be a constant source of renewed interest. When the position and kind of crop to be grown have been decided, the manuring and cultivation of the land can be carried out in an appropriate manner.

Potato-seed for spring planting should now be sprouted by placing it in single layers in trays and stacking them in a place which is light, free from frost, and where they will also be free from the attack of the potato-moth.

Small and Sundry Fruits.

Established plantations of bush-fruits may now be given a dressing of well-cured farm manure, which should then be ploughed under, taking care not to go to a depth exceeding 6 in. On heavy, moist loam alternate years may be sufficiently frequent for this dressing; the other year at this season a liberal dressing of suitable fertilizers may take its place. On light land an annual application of manures will probably be needed in addition to fertilizers. Where farm manure is scarce it is often advisable to apply a liberal dressing of phosphates and sow down the alleys with a green crop as soon as harvesting is completed.

The Homestead Garden.

Whether the garden is in the process of being newly made or is long-established, the planting-season is a period of the greatest importance to successful management. The term specially applies to the transplantation of hardwood plants, which may not generally be removed at other seasons without risk unless they are grown in pots. Early-autumn planting is generally best; where there is some risk of somewhat tender plants being exposed to hard conditions during the winter, spring planting will be advisable. Where winter planting is done, fine weather and a friable soil are necessary conditions when working on heavy land. Planting during a frost should not be done.

Position and arrangement are of the greatest importance, but should be decided at leisure before receiving the plants. At planting-time important precautions are to trim neatly straggling and broken roots, set the plants to the same depth as they previously grew, thoroughly firm the soil round the roots by tramping, then carefully study the plant and perform such pruning with sharp, well-set secateurs as may be necessary. Some authorities—very good ones, too—recommend for most hardwood plants that this pruning be done so late as the following winter after planting, —that is, after twelve months—but for newly planted subjects of this class, generally, such pruning as may be required would probably be best done in the spring, although pruning immediately after planting is often quite satisfactory.

A young plant usually has too many branches or not enough. Too many, if allowed to remain, quickly set up a congested condition which retards growth. Light and air for all parts of the plant are a necessity as fundamental as the soil in which it is set and the water it receives. Strong leading growth then, in excess of what is required, should be removed completely, cutting it away close up to the branch from which it originates. In many instances, as in the case of a rose-bush, three primary branches are sufficient; in the case of conifers which are grown as a pyramid with a central axis, more than one central leading growth is very disfiguring and others should be removed at once. Similar treatment is given to a climber where one or two leading growths are desired—the others are eliminated completely. This does not mean that every growth should be removed; light laterals are allowed to remain; it is the stronger leading growth only which is thinned, thus concentrating growth and vigour into selected branches which will form the base of the main framework of the future bush or tree. The leading growth should then be shortened back to a point just beyond a bud pointing in a desired direction for future growth. In the case where the young plant is of straggling growth, and it is desired to make it stool or branch out, the method is to cut away the leading growth at a height just above the point where branching is desired. Japanese cherries and that popular winter-flowering plant *Lasiandra macrantha* (*Tibouchina semidecandra*) are very commonly among those which usually require this treatment to secure a good display, which is markedly superior to that on trees untrained.

Many trees and shrubs require little pruning after they have become permanently established, but all require the attention above described in order to obtain quick development on the right lines.

—*W. C. Hyde, Horticulturist, Wellington.*

Transmission of Pathological Specimens by Post.—The restriction on the sending of specimens by parcel-post mentioned in the statement on page 175 of the March, 1936, *Journal* has been removed.

Lemon-curing for small Growers.—In the method of lemon-curing described on page 105 of the February, 1936, issue of this *Journal*, the use of sawdust is recommended. This advice needs to be qualified by the statement that sawdust derived from pines or from *Cupressus macrocarpa*, because of the possibility of its tainting the fruit, should not be used.—*W. K. Dallas.*

ANSWERS TO INQUIRIES.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

BEE-KEEPING.

Apiarist, Waipawa :—

1. What would be a fair division of the profits between the owner of the land on which the bees are kept and the apiarist—
   (*a*) When the landowner supplies the bees (black), and the apiarist the hives and all accessories, and looks after them in his own time and at his own expense ?
   (*b*) When the landowner merely gives permission to run bees on the property but supplies no part of the outfit ?
2. In certain books it is stated that gorse, broom, hawthorn, and manuka are good nectar-yielding plants. In this district, though there is abundance of all these, the bees are never seen on their flowers, except occasionally an odd one on gorse, collecting, probably, pollen rather than nectar. In the case of manuka, a hive bee is rarely seen on it, but the native bee frequently. Can you account for this ?
3. Is subterranean clover of any value for bees ?
4. Is the honey from cabbage-trees of good or inferior quality ?
5. Occasionally the honey in this district has a slightly bitter flavour. From what source would this probably be gathered ?
6. During the prevalence of the bad weather this spring I noticed the bees "balling" a young queen at the entrance to a hive, and on another occasion found one dead at the hive entrance. What would be the reason for this ?

The Horticulture Division :—

1. (*a*) A matter of arrangement between the parties concerned.
   (*b*) A nominal rental is usually charged. In many cases farmers grant the use of sites to beekeepers conditionally on being supplied with honey for the household use.
2. Gorse is not of value as a honey plant. It is the main supply of pollen in most districts. Broom supplies both pollen and nectar. Hawthorn is said to yield well in some localities, in others bees are never seen working the blossoms. Manuka : Heavy yields of honey are taken from this source. In Southland the late James Allan, who had considerable experience in that area with bees, reported that he had never seen a bee on the manuka-flowers. However, in the northern districts it yields honey abundantly.
3. Subterranean clover is valuable for bees.
4. Not known. The honey from this source is usually mixed with honey from other plants.
5. Probable source of bitter honey could no doubt be traced if sample of honey were made available.
6. The "balling" of your queens was probably due to the presence of more than one queen in the hive.

BORER IN TIMBER.

L. M. P., Napier :—

An old shearing-shed which is very badly infested with borer is to be replaced immediately by a new one in the same place. Could you tell me the best way to destroy the borer on the site ?

The State Forest Service :—

All timber infested with the borer in the vicinity of the site on which the new shed is to be erected should be destroyed, and care should be taken that no small pieces of wood or infested piles are left in place. If all borer-infested timber is destroyed the site itself will need no further attention.

DOSING OF SHEEP FOR CONTROL OF PARASITES.

C. S. M. HOPKIRK, Veterinary Laboratory, Department of Agriculture, Wallaceville.

IN the *Journal* for February, 1936, a paragraph was inserted warning farmers that there was every indication that the weather and food conditions of this abnormal season would prove beneficial for the growth of internal parasites, so bringing about severe losses in hoggets. Although there is not as much danger as was at first feared, yet lambs have not done well, and since weaning many have been backward and remain fit subjects for parasitic damage.

It was stated that a pound each of bluestone and Black Leaf 40 should be used in 5 gallons of water and that the dose should be ½ oz. for lambs and 1 oz. for young sheep.

Black Leaf 40 is an American trade-name for nicotine sulphate containing 40 per cent. of the alkaloid nicotine. There are on the market several preparations of nicotine sulphate (40 per cent.) labelled under various names, and there is no reason to believe that one is more efficient than another. Therefore, any brand of nicotine sulphate (40 per cent.) may be used.

In making further inquiries into the amount of nicotine sulphate going to a pound it was found to vary: 14 oz. to the pound was found common to one brand. On that account the prescription must now be altered to give ounces and not the bulk weight of one pound.

In respect to dosage, in other countries there are two distinct quantities in use, giving about the same total amounts of bluestone and nicotine. In one prescription ⅛ oz. of each is added to the pint of water and the dose is then about ⅛ oz. (10 c.c.) for lambs and a little more for hoggets—*i.e.*, ½ oz. This dosage is given by drenching-gun or by syringe. The other type of prescription gives the dose as 1 oz. suitable by its bulk for the usual New Zealand method of drenching with a measure. This latter prescription is made up of 1 oz. of each ingredient to the pint of water.

Starving is unnecessary as the copper sulphate has a chemical action which opens up the œsophageal groove to the fourth stomach, the drench going straight there instead of into the rumen first as with most materials given to ruminating animals. It is desirable, however, to keep the sheep away from water for a couple of hours after drenching.

The prescription, then, for New Zealand use may be given as follows: nicotine sulphate (40 per cent.), 16 fluid ounces; copper sulphate, 16 oz.; water, 5 gallons. Dose: One ounce for weaned lambs and 1½ oz. for two-tooths. If lambs are drenched before weaning ½ oz. may be given. The drench should be repeated at not more than three-weeks intervals throughout the season.

INVENTIONS OF AGRICULTURAL INTEREST.

APPLICATIONS for patents, published with abridged specifications in the *New Zealand Patent Office Journal* from 27th February, 1936, to 26th March, 1936, include the following of agricultural interest:—

No. 73017 and No. 73510: Concrete post; H. W. and L. A. James. No. 73458: Soldering-iron; G. R. McCarthy. No. 73842: Harrow; A. S. Bevin. No. 73904: Lawn-mower attachment; S. Lecky. No. 73930: Harrow; T. G. Aston and H. C. Frampton. No. 74020: Milk-can ventilating; F. Fitzgerald. No. 74186: Teat-cup; Gordon Vacuum Break Milkers, Ltd. No. 74324: Cognate with No. 74020 above. No. 74957: Fencing-post; C. A. Mason. No. 75164: Fruit-preserving; W. G. Hampson. No. 75346: Agricultural implement; J. A. Fishleigh. No. 75405: Teat-cup; C. E. Ellison. No. 73364: Meat-handling; R. Robinson. No. 73647: Veterinary remedy; H. MacK. Salmond. No. 74094: Milking-machine; H. H. Johnson. No. 74223: Insecticidal oil composition; California Spray-chemical Corp. No. 74300: Teat-cup claw; A. H. Atchley. No. 75012: Flour-treatment; O. H. Joos. No. 75225: Horse-collar; D. G. Robinson. No. 75351: Distribution of vitamins in milk; Nestle and Anglo-Swiss Condensed Milk Co.

Copies of full specifications and drawings in respect of any of the above may be obtained from the Commissioner of Patents, Wellington, price 1s. prepaid.

WEATHER RECORDS: MARCH, 1936.

Dominion Meteorological Office.

NOTES FOR MARCH.

THOUGH not nearly so much so as February, March was a wet month in most districts, and there are few in which the soil is really dry. Feed is abundant and stock are reported to be in good condition. Pastures are, however, rank and soft, and lambs still fail to fatten well. The milk-yield appears on the whole to be well maintained, though in Taranaki cold winds had a deleterious effect. Little progress has been made with the harvesting of the wheat crop, much of which is now in the stack. The situation regarding root crops varies considerably from district to district, growth being poor and pests numerous in some, while in others the reports are favourable. Supplies of feed for the winter, however, seem fairly well assured.

Rainfall.—Rainfall was again very heavy in the northern portion of the Auckland Peninsula. It was much above normal also in the Bay of Plenty, East Coast, south central regions, and the South Taranaki Bight. Elsewhere in the North Island it was below normal. In the South Island conditions were variable in western districts and about the main ranges generally, but elsewhere the month was a very wet one. Large areas of Canterbury had three times the average fall.

Temperature.—Temperatures were everywhere below normal. In the far North the departures were small, but they increased to the southward and were greater on the east coast than on the west. For the country as a whole, it was probably the coldest March ever experienced. Frosts were not particularly numerous or severe.

Sunshine.—There was much less sunshine than usual in most of the North Island, though the Bay of Plenty and Wellington fared well enough. In the South Island all reports indicate more than the normal amount, and in most cases the excess was considerable.

Storm Systems.—On the night of the 2nd to the 3rd a depression, which had been shallow when it crossed the country, deepened very much while to the eastward. In consequence, southerly gales blew and heavy rain fell over the South Island and across Cook Strait to the southern portion of the North Island.

Following this, fine weather ruled for several days. On the night of the 6th to the 7th, however, a depression moved from the north to the vicinity of East Cape, and, though shallow, it caused very heavy rain between Hawke's Bay and East Cape.

Following the passage of an innocuous depression on the 7th, pressure again fell rapidly to the east of New Zealand on the 8th and continued low until the 11th. Gales from between west and south were experienced at many places, and heavy rain was almost general. There were heavy snowfalls on the high levels.

Heavy rain again fell over the South Island in connection with a depression which moved on to the Dominion during the 20th and 21st.

On the 25th a deep cyclone, which had first appeared off the Queensland coast on the 18th passed Norfolk Island on the westward side and on the 26th was centred near Cape Maria van Diemen. Moving in a south-easterly direction, it was centred off East Cape on the morning of the 27th, and soon moved away. It was responsible for very severe gales and remarkably high tides from Auckland northwards, and much damage was done. Heavy rain was recorded over most of the North Island.

From the 28th until the end of the month, a westerly depression, followed by a series of secondaries, caused a second series of westerly or south-westerly gales, which were severe in many places.

RAINFALLS FOR MARCH, 1936, AT REPRESENTATIVE STATIONS.

Station.	Total Fall.	Number of Wet Days.	Maximum Fall.	Average March Rainfall.	Total Rainfall to Date.	Average Rainfall to Date.
			North Island.			
	Inches.		Inches.	Inches.	Inches.	Inches.
Kaitaia	2·08	8	0·79	3·10	20·27	10·54
Russell	7·76	6	5·50	3·28	45·35	9·52
Whangarei	5·90	17	3·24	4·45	29·09	12·25
Auckland	2·48	12	0·56	3·27	18·64	9·81
Hamilton	3·14	12	0·87	3·76	19·14	10·24
Rotorua	4·03	12	1·22	3·48	27·02	11·44
Kawhia	2·96	8	0·91	4·21	16·12	9·83
New Plymouth ..	2·06	13	0·92	3·68	16·79	11·80
Riversdale, Inglewood ..	4·80	12	2·69	7·05	28·93	20·58
Whangamomona ..	3·06	4	2·25	4·98	18·47	14·45
Hawera	2·24	9	0·64	3·01	14·34	8·92
Tairua	3·11	12	0·90	5·21	21·83	13·55
Tauranga	6·17	14	3·24	3·92	24·07	11·73
Maraehako Station, Opotiki	5·37	9	3·96	3·96	24·44	11·69
Gisborne	5·43	16	2·53	4·42	20·65	10·60
Taupo	1·92	8	0·58	3·14	19·35	9·25
Napier	6·15	14	2·13	2·66	23·21	7·62
Hastings	5·89	14	2·45	2·76	21·91	6·94
Whakarara Station ..	4·35	8	1·10	..	26·09	..
Taihape	2·67	15	0·87	2·60	18·17	8·19
Masterton	..	..	..	2·75	..	8·09
Patea	3·72	12	1·16	3·35	15·72	9·34
Wanganui	2·80	10	1·11	2·47	15·02	7·72
Foxton	2·33	7	1·05	1·98	14·11	6·19
Wellington	4·64	13	1·38	3·20	17·88	8·84
			South Island.			
Westport	6·50	14	2·09	7·50	13·44	21·05
Greymouth	9·39	14	3·10	8·80	18·58	24·18
Hokitika	9·53	15	3·09	9·51	17·76	26·83
Ross	12·80	12	4·45	10·73	22·72	32·03
Arthurs Pass	11·52	12	3·46	13·19	20·82	37·21
Okuru, South Westland	10·44	6	3·50	14·15	35·01	36·40
Collingwood	3·22	10	1·88	5·81	20·35	17·68
Nelson	1·45	6	0·60	2·92	8·21	8·45
Spring Creek, Blenheim	1·88	7	0·92	1·98	9·80	6·38
Seddon	1·75	9	0·52	2·00	10·27	5·69
Hanmer Springs ..	4·94	15	2·02	3·26	22·52	10·47
Highfield, Waiau ..	2·87	9	1·18	2·84	18·45	8·42
Gore Bay	4·77	11	2·40	2·13	15·61	7·39
Christchurch	6·07	13	2·27	1·84	14·25	5·73
Timaru	4·38	8	1·35	2·16	14·32	6·34
Lambrook Station, Fairlie	..	..	..	2·34	..	6·58
Benmore Station, Clearburn	2·12	8	1·05	2·41	4·76	6·80
Oamaru	3·20	10	1·51	1·78	12·56	5·61
Queenstown	3·24	12	0·78	2·62	7·20	7·46
Clyde	1·71	8	0·37	1·49	3·32	4·40
Dunedin	6·12	15	2·32	2·90	16·21	9·02
Wendon	4·43	17	0·78	2·74	8·60	8·20
Balclutha	4·76	13	1·34	2·31	7·42	6·61
Invercargill	4·86	21	1·10	3·89	11·30	11·07
Puysegur Point ..	7·69	21	1·74	7·97	19·43	21·33
Half-moon Bay ..	4·83	20	0·59	5·37	9·31	14·27